

# SUBJECT INDEX

## A

Abetalipoproteinemia  
human milk and, 421, 423, 427  
Acetaldehyde  
collagen synthesis and, 372  
Acetate  
dietary fiber and, 27, 29  
Acetazolamide  
placental nutrient transport and, 195  
Acetic acid  
dietary fiber and, 28  
Acetyl CoA  
cobalamin deficiency and, 63-64  
Acetyl CoA carboxylase  
adipose tissue and, 213  
N-Acetyl-L-cysteine  
food processing and, 127, 131-32  
N-Acetylglutamate  
urea cycle and, 83  
Acetyl LDL  
vitamin A transport and, 48  
Acid phosphatase  
keratomalacia and, 7  
Acitretin  
retinoids and, 170  
Aconitase  
iron-responsive element binding proteins and, 352, 355, 357, 360-62  
iron-responsive elements and, 349-51  
Actin  
placental nutrient transport and, 184  
Actinic keratosis  
retinoids and, 167, 174  
Actinomycin D  
ferritin and, 353  
iron-responsive element binding proteins and, 360  
Acyl CoA  
cellular energy metabolism and, 336  
Acyl CoA-binding protein  
adipose tissue and, 213, 217  
Acyl CoA:retinol acyltransferase  
esterification of retinol in erythrocytes and, 39, 50, 52  
Acyl CoA synthetase  
adipose tissue and, 218

Adaptation  
to nutritional stress, 4-6  
Adenine  
cobalamin deficiency and, 71, 74  
Adenocarcinomas  
retinoids and, 168  
Adenopathy  
diffuse  
toxic oil syndrome and, 247  
Adenosine  
cobalamin deficiency and, 74  
placental nutrient transport and, 193  
Adenosine diphosphate (ADP)  
cellular energy metabolism and, 331-36, 338, 340-41  
Adenosine triphosphate (ATP)  
cellular energy metabolism and, 331-41  
placental nutrient transport and, 194-95  
Adenosylcobalamin-dependent methylmalonyl CoA mutase  
cobalamin neuropathy and, 63-67  
Adenosylhomocysteine  
cobalamin neuropathy and, 70-71  
hyperhomocyst(e)inemia and, 281  
Adenosylmethionine  
cobalamin neuropathy and, 67-70, 74  
hyperhomocyst(e)inemia and, 281-82  
Adenylate cyclase  
parathyroid hormone and, 382  
Adenyl cyclase  
placental nutrient transport and, 184  
ADH3 gene  
retinoic acid synthesis and, 51  
Adipocyte lipid-binding protein  
adipose tissue and, 213, 217-18, 221-23  
Adipose tissue  
brown, 207-8, 214-15, 223-26  
cancer risk and, 401, 410-11  
cell differentiation in vivo and, 215-24

chylomicron remnant retinyl esters and, 40  
human milk and, 421-22  
lactational capacity and, 103-4  
research trends and, 225-26  
secretory cells and, 224-25  
space flight and, 260  
white, 207-15, 225-26  
Adipsin  
adipose tissue and, 213, 218, 221-22, 224, 226  
Adrenocorticotrophic hormones  
tryptophan and, 237  
 $\alpha$ -Adrenoreceptors  
adipose tissue and, 213, 217  
 $\beta$ -Adrenoreceptors  
adipose tissue and, 213-15, 217, 223  
placental nutrient transport and, 184  
Adults  
osteomalacia in, 380  
Aflatoxin B<sub>1</sub>  
retinoids and, 163  
structure of, 163  
Africa  
albinism and, 154  
human milk composition and, 427  
lactose intolerance and, 13  
Age  
urea cycle and, 82  
Alanine  
food processing and, 121, 132  
placental nutrient transport and, 186-87  
Albinism  
 $\beta$ -carotene and, 154  
Albumin  
human milk and, 421  
hyperhomocyst(e)inemia and, 281  
marasmus and, 5  
Alcohol  
gallstones and, 317  
Alcohol dehydrogenases  
retinoic acid synthesis and, 51  
Alditol acetates  
dietary fiber and, 23  
Alginate  
dietary fiber and, 25

- fat substitutes and, 481
- Alkaline phosphatase
  - placental nutrient transport and, 184
- Alkyl diacylglycerols
  - human milk and, 422
- Alkyl retinamides
  - cancer and, 171
- Allergies
  - food processing and, 125-26, 133
- All-trans-retinoic acid
  - retinol catabolism and, 52
- All-trans-retinoyl  $\beta$ -glucuronide
  - retinol catabolism and, 52
- Aluminum
  - placental nutrient transport and, 199
- American diet
  - antioxidant sources in, 145-47
- Amines
  - heterocyclic
    - food processing and, 133
- Amino acids
  - cobalamin neuropathy and, 64, 66-67
  - collagen and, 370, 373-76
  - food processing and, 120-25, 127-32
  - gallstones and, 313-14
  - hyperhomocyst(e)inemia and, 280, 292
  - iron-responsive element binding proteins and, 352, 363
  - placental nutrient transport and, 186-89
  - racemization of, 120-22
  - space flight and, 268-69
  - urea cycle and, 84
- Aminoisobutyrate
  - placental nutrient transport and, 188
- 5'-Aminolevulinatase synthase (ALAS)
  - erythroid
    - iron-responsive elements and, 349-51, 356-57
- Ammonia
  - short-chain fatty acids and, 28-29
  - urea cycle and, 81-82, 84, 95
- Ammonium acetate
  - urea cycle and, 84
- Ammonium citrate
  - ferritin and, 353-54
  - urea cycle and, 84
- $\alpha$ -Amylases
  - dietary fiber and, 22
- Amylose
  - dietary fiber and, 23
- Androgens
  - adipose tissue and, 214, 224-26
- Anemia
  - pernicious
    - cobalamin deficiency and, 60, 65
- Aneurysms
  - hyperhomocyst(e)inemia and, 284
- Angiogenesis factors
  - adipose tissue and, 210, 225-26
- Anilide
  - toxic oil syndrome and, 248
- Anion exchanger
  - placental nutrient transport and, 190, 198
- Anthrax
  - cancer and, 165-66
- Antibodies
  - adipose tissue and, 220
  - gold-labeled
    - retinol-binding protein and, 48
  - monoclonal
    - food processing and, 125
- Antioxidants, dietary
  - cancer and, 139-55, 407-8
  - collagen metabolism and, 379
  - epidemiologic studies and, 144-54
  - food processing and, 131
  - human milk and, 427-28
  - laboratory animal research and, 142-44
  - theoretical roles in cancer prevention and, 140-42
- Antithrombin III
  - hyperhomocyst(e)inemia and, 293-94
- Apolipoprotein E
  - adipose tissue and, 213, 217-18, 224
  - bile lipids and, 303, 305
  - cancer risk and, 406-7
  - gallstones and, 302, 310, 312
  - placental nutrient transport and, 190
- Apolipoproteins
  - bile lipids and, 305
  - cancer risk and, 406
  - hyperhomocyst(e)inemia and, 287
- Apotransferrin
  - placental nutrient transport and, 198
- Appendicitis
  - dietary fiber and, 315
- Apples
  - antioxidant properties and, 146
  - dietary fiber and, 22, 24, 30
  - food processing and, 132
- Arabinose
  - dietary fiber and, 21-22
- Arabinoxylan
  - dietary fiber and, 20
- Arachidonate
  - bile lipids and, 303
  - gallstones and, 311
- Arachidonic acid
  - adipose tissue and, 218, 220-21
  - gallstones and, 304, 311-12, 316
  - human milk and, 435
  - hyperhomocyst(e)inemia and, 293-94
- Arginase
  - urea cycle and, 82-89, 92
- Arginine
  - enzymes and, 82-83, 87-90, 95
  - placental nutrient transport and, 188
  - urea cycle and, 82-83, 88, 91, 93, 95
- L-Arginine ureohydrolase
  - urea cycle and, 82
- L-Argininosuccinate arginine-lyase
  - urea cycle and, 82
- Argininosuccinate lyase
  - urea cycle and, 82-83, 85-89, 91-92
- Argininosuccinate synthetase
  - urea cycle and, 81, 83, 85-93
- Arotinoids
  - cancer and, 165-66, 168
- Arteriosclerosis
  - hyperhomocyst(e)inemia and, 280, 284-85, 288, 290, 292
- Arthralgia
  - eosinophilia-myalgia syndrome and, 247
- Arylsulphatase
  - keratomalacia and, 7
- Asbestos
  - antioxidants and, 154
  - retinoids and, 162
- Ascorbate
  - browning
    - food processing and, 124-25
  - dietary fiber and, 25
  - placental nutrient transport and, 190-91
- Ascorbic acid
  - see Vitamin C
- ASC system
  - placental nutrient transport and, 186-87

- Asians  
  lactose intolerance and, 13-14
- Asparagus stems  
  dietary fiber and, 20
- Aspartate  
  placental nutrient transport and, 188
- L-Aspartate ligase  
  urea cycle and, 82
- Aspirin  
  adipose tissue and, 220
- A system  
  placental nutrient transport and, 186-87
- Ataxia  
  cobalamin deficiency and, 60, 62
- Atherosclerotic plaques  
  hyperhomocyst(e)inemia and, 284-85
- ATPase  
  placental nutrient transport and, 184, 194-95
- ATP synthase  
  cellular energy metabolism and, 332-33, 336-37, 340
- Axerophthene  
  cancer and, 165, 168  
  structure of, 162
- Axonal abnormalities  
  eosinophilia-myalgia syndrome and, 245
- 5-Azacytidine  
  adipose tissue and, 215  
  urea cycle and, 94
- Azaserine  
  cancer and, 170, 173
- Azobenzenes  
  retinoids and, 163
- Azoreductase  
  dietary fiber and, 29
- Azotobacter vinelandii*  
  iron-responsive elements and, 349, 351
- B**
- Baboons  
  hyperhomocyst(e)inemia and, 284  
  lactational capacity and 110
- Bacillus amyloliquefaciens*  
  tryptophan and, 240-41
- Bacon  
  nitrosamines and, 125
- Bacteria  
  intestinal  
    dietary fiber and, 26-31, 33
- Barley  
  dietary fiber and, 20
- food processing and, 132
- Basal cell carcinomas  
  retinoids and, 162, 165-66, 174
- Basal lamina  
  placental nutrient transport and, 184
- Basal metabolic rate  
  cellular energy metabolism and, 340
- Bassorin  
  dietary fiber and, 22
- Beans  
  dietary fiber and, 20
- Bengal gram  
  lathyrism and, 12
- Benzo(a)pyrene  
  carotenoids and, 143  
  retinoids and, 163, 165-66, 169, 172, 174  
  structure of, 163
- Betaine  
  cobalamin deficiency and, 69-70, 74  
  hyperhomocyst(e)inemia and, 285, 295
- Betaine-homocysteine methyltransferase  
  cobalamin deficiency and, 69  
  hyperhomocyst(e)inemia and, 281-83
- Bezafibrate  
  adipose tissue and, 221
- Bicarbonate  
  dietary fiber and, 29  
  placental nutrient transport and, 190, 196, 198  
  urea cycle and, 82
- Bile  
  acids  
    cancer risk and, 408  
    dietary fiber and, 25-27  
    gallstones and, 301-6  
    placental nutrient transport and, 190  
  lipids  
    gallstones and, 306-17  
  proteins  
    gallstones and, 305
- Bilirubin  
  dietary fiber and, 27
- Bilirubinate salts  
  calcium  
    gallstones and, 305
- Biotin  
  fat substitutes and, 480  
  placental nutrient transport and, 191-92
- Bladder cancer  
  carotenes and, 149  
  cholesterol and, 405  
  retinamides and, 164
- retinoids and, 162, 165, 171, 173-74  
  vitamin C and, 144
- Blastocysts  
  placental nutrient transport and, 188
- Blindness  
  nutritional  
    in India, 6-8
- Blood  
  coagulation  
    hyperhomocyst(e)inemia and, 293-94  
  glucose  
    dietary fiber and, 24  
  maternal  
    placental nutrient transport and, 184
- Blood-brain barrier  
  cellular uptake of retinol and, 48-49
- Blood nutrient markers  
  antioxidants and, 151-53
- Blood pressure  
  space flight and, 264
- Blood-related cancers  
  cholesterol and, 404  
  retinoids and, 174
- Blood-testis barrier  
  cellular uptake of retinol and, 48-49
- Blood-urea nitrogen (BUN)  
  space flight and, 268-69
- Body composition changes  
  space flight and, 260-64
- Body mass index (BMI)  
  gallstones and, 306
- Bone  
  collagen metabolism and, 372, 374, 381-83  
  fluorosis and, 12-13  
  space flight and, 260, 263-64
- Bone marrow  
  chylomicron remnant retinyl esters and, 40-41  
  vitamin D and, 381
- Boron trifluoride-methanol  
  human milk and, 425-26
- Bowel cancer  
  cholesterol and, 404
- Bowman-Birk inhibitor  
  food processing and, 127
- B-oxalyl aminoalanine (BOAA)  
  lathyrism and, 12
- Brain  
  cancer  
    cholesterol and, 398, 405-6, 410  
  cobalamin deficiency and, 60, 63, 65, 68-69, 71-73, 75  
  urea cycle and, 95

- Bran**  
 dietary fiber and, 20, 23, 30-31  
 gallstones and, 316
- Branched-chain fatty acids**  
 cobalamin neuropathy and, 63-66  
 dietary fiber and, 28
- Bread**  
 antioxidant properties and, 146  
 food processing and, 125, 127-29
- Breast cancer**  
 carotenes and, 147-48, 152  
 cholesterol and, 396, 398-99, 405, 410  
 retinamides and, 164  
 retinoids and, 162, 164-65, 168-69, 173-74  
 vitamin C and, 144, 147, 150  
 vitamin E and, 144, 151-52
- Breastfeeding**  
 fat-soluble vitamins and, 428-32  
 lipids and, 418-37  
 maternal nutritional status and, 103-15  
 nutritional aspects of, 433-36  
 retinol and, 50
- Broccoli**  
 antioxidant properties and, 146
- Bromomethylbenz(α)anthracene**  
 cancer and, 165
- Browning reactions**  
 food processing and, 123-25, 128, 132-33
- Brush border membrane**  
 placental nutrient transport and, 49, 189-90, 193, 195-99
- Bulk factor**  
 protein-calorie malnutrition and, 3
- Bulking agents**  
 gallstones and, 316
- Bullfrogs**  
 iron-responsive elements and, 349-51, 355
- Butter fat**  
 gallstones and, 312  
 infant formulas and, 432
- N-Butyl-N-(4-hydroxybutyl)nitrosamine (HO-BBN)**  
 retinoids and, 163, 170, 174  
 structure of, 163
- Butyrate**  
 adipose tissue and, 221  
 dietary fiber and, 28-29
- n-Butyric acid**  
 dietary fiber and, 28
- 1-Butyrylglycerol**  
 adipose tissue and, 210
- C**
- Ca<sup>2+</sup>**  
 cellular energy metabolism and, 334-37  
 collagen metabolism and, 375  
 complex carbohydrates and, 25  
 human milk and, 434  
 pectins and, 21  
 placental nutrient transport and, 193-95  
 space flight and, 263-64, 270-71  
 vitamin D and, 380
- Cabbage**  
 antioxidant properties and, 146  
 dietary fiber and, 20
- Cadmium**  
 placental nutrient transport and, 199
- Cafeteria diet**  
 lactational capacity and, 106-8, 114
- Calcitonin**  
 collagen metabolism and, 381-82
- Calories**  
 empty, 3  
 gallstones and, 306-10  
 human milk and, 423  
 protein-energy malnutrition and, 3-4
- Campesterol**  
 human milk and, 424
- Canavanine**  
 urea cycle and, 90-91
- Cancer**  
 antioxidants and, 139-55  
 cholesterol and, 391-411  
 retinoids and, 161-75
- Cannabinoids**  
 placental nutrient transport and, 184
- Cantaloupe**  
 antioxidant properties and, 146
- Capillary endothelium**  
 fetal  
 placental nutrient transport and, 184
- Carbamoyl phosphate**  
 urea cycle and, 81
- Carbamyl phosphate synthetase I**  
 urea cycle and, 81, 83, 85-88, 90-91
- Carbaprostacyclin**  
 adipose tissue and, 220
- Carbohydrate**  
 adipose tissue and, 211-12  
 dietary fiber and, 19-20, 23-25, 28-31, 33  
 food processing and, 123-24, 126-28, 132  
 gallstones and, 314-15  
 human milk and, 422  
 lactational capacity and, 109  
 space flight and, 267-68
- Carbolines**  
 food processing and, 131
- Carbon tetrachloride**  
 collagen synthesis and, 372
- Carbonyl compounds**  
 food processing and, 131
- Carcinogens**  
 food processing and, 131, 133
- Carcinoid syndrome**  
 serotonin and, 238
- Cardiac abnormalities**  
 eosinophilia-myalgia syndrome and, 245  
 space flight and, 270
- Cardiovascular deconditioning**  
 space flight and, 260
- Carmitine**  
 placental nutrient transport and, 190
- Carnivores**  
 dietary fiber and, 28
- α-Carotene**  
 human milk and, 429
- β-Carotene**  
 antioxidant activity of, 143-44, 151-54  
 cancer risk and, 407  
 human milk and, 430  
 intestinal absorption of, 38-39  
 nutritional blindness and, 7-8  
 retinoic acid synthesis and, 51
- Carotenes**  
 cancer and, 147-49  
 major dietary sources of, 145-47
- Carotenoids**  
 antioxidant activity of, 140-44  
 cancer risk and, 407  
 human milk and, 429-30  
 intestinal absorption of, 38-39  
 space flight and, 271  
 vitamin A and, 38
- Carrageenan**  
 fat substitutes and, 481
- Carrots**  
 antioxidant properties and, 146  
 dietary fiber and, 20, 22-23
- Casein**  
 food processing and, 124-25, 132  
 gallstones and, 313

- human milk and, 423  
RDA for, 127
- Catalase  
hyperhomocyst(e)inemia and, 292
- Cathepsin G  
collagen and, 374
- Cats  
taurine and, 301-2
- Caucasians  
lactose intolerance and, 13
- CD4  
eosinophilia-myalgia syndrome and, 250
- C/EBP element  
urea cycle and, 91-92
- Cecum  
cancer of  
cholesterol and, 404  
dietary fiber and, 26-29  
gallstones and, 315
- Cellular retinoic acid-binding protein (CRABP)  
cancer and, 164
- Cellular retinol-binding protein (CBRP)  
blood-brain barrier and, 49  
cancer and, 164, 169  
retinoids and, 39-40, 42-43, 45-46, 48-51
- Cellulose  
dietary fiber and, 21  
structure of, 21
- Cell wall  
plant  
dietary fiber and, 21-24
- Central nervous system (CNS)  
cobalamin neuropathy and, 67-70
- Cereal-legume-based diets  
protein-calorie malnutrition and, 3
- Cereals  
antioxidant properties and, 146  
dietary fiber and, 20, 22
- Cerebral atrophy  
cobalamin deficiency and, 72
- Cerebrosides  
human milk and, 423
- Cerebrovascular disease  
hyperhomocyst(e)inemia and, 286, 288-92
- Cervical cancer  
antioxidants and, 141  
carotenes and, 148-149, 151  
cholesterol and, 405-6, 410  
retinoids and, 173  
vitamin C and, 149-150  
vitamin E and, 149, 151
- Cervical dysplasia  
retinoids and, 162, 173
- Cheese  
antioxidant properties and, 146
- Chemoprevention  
cancer  
antioxidants and, 140  
retinoids and, 161-75
- Chenodeoxycholate  
gallstones and, 316-17
- Chenodeoxycholic acid  
formation of, 301  
gallstones and, 302, 313, 317
- Chenodeoxycholin  
dietary fiber and, 26
- Chicks  
iron-responsive elements and, 349-50  
vitamin D and, 381
- Children  
cancer risk and, 407  
cobalamin deficiency and, 67, 70  
collagen metabolism and, 375  
dietary fiber and, 25  
hyperhomocyst(e)inemia and, 283-84  
iron-deficiency anemia and, 8  
5,10-methylenetetrahydrofolate deficiency and, 70  
protein-energy malnutrition and, 3-8  
rickets and, 380  
xerophthalmia and, 429
- China  
breast cancer and, 147  
cancer risk and, 397, 411  
esophageal cancer and, 154, 173
- Chloride  
placental nutrient transport and, 189, 196-99
- Chloroacetate  
cellular energy metabolism and, 339
- Chloropropanediol  
human milk and, 422-23
- Cholate  
gallstones and, 302, 304, 310, 313
- Cholecystokinin (CCK)  
gallstones and, 305
- Cholestanol  
human milk and, 424
- Cholesterol  
adipose tissue and, 218, 226  
cancer risk and, 391-411  
dietary fiber and, 26  
gallstones and, 300-19  
human milk and, 420, 422, 424, 428, 431  
infant formulas and, 424  
inter-photoreceptor retinoid-binding protein and, 46  
placental nutrient transport and, 190  
space flight and, 268
- Cholesterol ester transfer protein  
adipose tissue and, 218, 224, 226
- Cholesterol solubility index (CSI)  
gallstones and, 307, 309
- Cholesteryl esters  
bile lipids and, 303  
gallstones and, 305, 317  
human milk and, 422, 428, 434
- Cholestyramine  
cholesterol and, 402  
gallstones and, 316
- Cholic acid  
formation of, 301  
gallstones and, 302, 319
- Choline  
hyperhomocyst(e)inemia and, 283, 285, 294  
placental nutrient transport and, 190
- Choriocarcinoma  
placental nutrient transport and, 189
- Chromate  
placental nutrient transport and, 199
- Chylomicrons  
human milk and, 421  
retinyl esters and, 40-41
- Chyme  
dietary fiber and, 22
- Chymotrypsin  
inhibitor  
food processing and, 126
- Cigarette smoking  
antioxidants and, 147, 154  
hyperhomocyst(e)inemia and, 287  
retinoids and, 162, 170
- Cimetidine  
placental nutrient transport and, 196
- 13-*cis*-N-ethylretinamide  
cancer and, 170, 175
- 4-*cis*-4-oxoretinoic acid  
retinol catabolism and, 52
- 13-*cis* retinoic acid  
cancer and, 165-67, 169-75  
retinol catabolism and, 52  
structure of, 162
- Citrate  
aconitase and, 352  
cellular energy metabolism and, 339, 341  
dietary fiber and, 25  
food processing and, 125

- placental nutrient transport and, 190
- Citrate lyase  
adipose tissue and, 213
- Citrulline  
urea cycle and, 82, 87-90
- Clastogenicity  
food processing and, 124
- Cleft palate  
vitamin A and, 377
- Clofibrate  
cancer risk and, 402-3, 409
- Clonidine  
placental nutrient transport and, 196
- c-Myc protein  
adipose tissue and, 223
- Cobalamin  
analogue toxicity of, 73, 75  
biochemical reactions requiring, 61  
hyperhomocyst(e)inemia and, 283-85, 294  
neuropathy, 59-60  
adenosylcobalamin-dependent methylmalonyl CoA mutase and, 63-67  
animal models of, 61-63  
defective methylation and, 67-76  
nitrous oxide and, 61  
placental nutrient transport and, 191-92
- Cobalt  
food processing and, 123
- Coconut oil  
gallstones and, 308  
infant formulas and, 433
- Colestipol hydrochloride  
cholesterol and, 402-3
- Colipase  
human milk and, 433-34
- Collagen  
adipose tissue and, 213, 221-23  
eosinophilia-myalgia syndrome and, 244  
extracellular turnover of, 374  
gene expression and, 371-72  
heterogeneity of, 371  
hyperhomocyst(e)inemia and, 284  
intracellular assembly of, 373-74  
metabolism  
amino acid deficiency and, 374-76  
bone homeostasis and, 381-83  
extracellular matrix and, 370-74  
mineral balance and, 381-83  
nutrition and, 376-77  
vitamins and, 377-80  
regulation of synthesis of, 372  
tissue distribution of, 370-72  
turnover of, 372-74  
types of, 370-72
- Colon  
cancer  
antioxidants and, 141  
 $\beta$ -carotene and, 143, 149, 152, 154  
cholesterol and, 392, 395-96, 398, 404, 408, 410  
food processing and, 127  
retinoids and, 165, 171-72, 174  
vitamin C and, 144, 150, 154  
vitamin E and, 144, 152, 154  
dietary fiber and, 22, 26-27, 29-31, 33
- Colostrum  
human milk and, 430
- Complement component C<sub>3</sub>  
adipose tissue and, 224
- Complement factors  
adipose tissue and, 224
- Computed tomography (CT)  
cobalamin deficiency and, 72
- Concentration difficulties  
eosinophilia-myalgia syndrome and, 246
- Coordinated multisite regulation  
cellular energy metabolism and, 331-41
- Copper  
fluorosis and, 13  
food processing and, 122-123  
hyperhomocyst(e)inemia and, 293-94
- Copy DNA (cDNA)  
ferritin, 353  
iron-responsive element binding proteins and, 363  
urea cycle and, 94
- Corn  
fat substitutes and, 481  
pellagra and, 10
- Corn oil  
gallstones and, 308, 313
- Cornstarch  
gallstones and, 315
- Coronary artery disease  
dietary fiber and, 315  
hyperhomocyst(e)inemia and, 280, 288-92
- Corticosterone  
adipose tissue and, 219, 221
- Cortisol  
adipose tissue and, 212, 214  
hyperhomocyst(e)inemia and, 283  
kwashiorkor and, 4  
marasmus and, 4  
protein-calorie malnutrition and, 4
- Cough  
eosinophilia-myalgia syndrome and, 244, 246  
toxic oil syndrome and, 247
- Cramps  
eosinophilia-myalgia syndrome and, 247  
toxic oil syndrome and, 248
- Creamatocrit  
human milk lipid determination and, 419
- Creatine  
space flight and, 268-69  
urea cycle and, 82
- Creatinine kinase  
eosinophilia-myalgia syndrome and, 244
- CRE-binding protein (CREB)  
urea cycle and, 93
- Cretinism  
endemic goiter and, 10
- Crohn's disease  
collagen metabolism and, 377
- Croton oil  
retinoids and, 165-66  
vitamin C and, 144
- Cryoglobulin  
eosinophilia-myalgia syndrome and, 244
- $\beta$ -Cryptoxanthin  
human milk and, 429
- Curacao  
human milk composition and, 427
- Cushing's syndrome  
adipose tissue and, 212
- Cutin  
dietary fiber and, 20
- Cyclic adenosine monophosphate (cAMP)  
adipose tissue and, 220-21  
placental nutrient transport and, 184, 195  
urea cycle and, 84-86, 88-89, 91-94
- Cycloheximide  
iron-responsive element binding proteins and, 360
- Cycloleucine  
cobalamin deficiency and, 67-68

- Cyclophosphamide  
  eosinophilia-myalgia syndrome and, 247
- Cyclosporin A  
  eosinophilia-myalgia syndrome and, 247
- Cystathionine  
  cobalamin deficiency and, 74  
  homocysteine metabolism and, 279
- Cystathione  $\beta$ -synthase  
  hyperhomocyst(e)inemia and, 280, 282-83, 286-87, 292
- Cysteine  
  cobalamin neuropathy and, 62, 69-71, 73-74  
  food processing and, 121, 131-132  
  gallstones and, 314  
  placental nutrient transport and, 187  
  toxicity of, 70-71
- Cystic fibrosis  
  human milk and, 421-23, 427
- Cystine  
  food processing and, 122, 127
- Cytochalasin B  
  placental nutrient transport and, 185
- Cytochrome oxidase  
  cellular energy metabolism and, 332-33, 335-36, 340
- Cytochrome P450  
  5'-aminolevulinate synthase and, 356  
  retinoids and, 51-52
- Cytokines  
  collagen synthesis and, 372
- Cytosol  
  urea cycle and, 82
- Cytotrophoblast  
  placental nutrient transport and, 184
- D**
- Dairy products  
  gallstones and, 312  
  infant formulas and, 432  
  space flight and, 270-71
- Deaf mutism  
  endemic goiter and, 10
- Dehydroacetic acid (DHA)  
  human milk and, 436
- Dehydroascorbate  
  placental nutrient transport and, 190
- Dehydroepiandrosterone  
  adipose tissue and, 221, 225
- Dehydrogenases  
  cellular energy metabolism and, 332, 334-35, 337, 339-40  
  retinoic acid synthesis and, 51
- Demyelination  
  cobalamin neuropathy and, 60, 62, 64-66, 68, 70-72, 75-76  
  eosinophilia-myalgia syndrome and, 245
- Deoxycholate  
  gallstones and, 312, 316
- Deoxycholic acid  
  formation of, 301
- 2'-Deoxycofomycin  
  placental nutrient transport and, 193
- Deoxy-fructosyl-L-lysine  
  food processing and, 124
- Desaturases  
  gallstones and, 311  
  human milk and, 436
- Desferrioxamine  
  iron-responsive element binding proteins and, 360
- Desmemet's membrane  
  collagen and, 371
- Desmosterol  
  human milk and, 424
- Detoxification  
  cellular  
    food processing and, 132
- Deuterium oxide method  
  milk volume determination and, 418
- Development  
  retinoids and, 444-56
- Dexamethasone  
  adipose tissue and, 219, 221  
  urea cycle and, 87, 89, 92
- Dextrins  
  fat substitutes and, 481
- Diabetes mellitus  
  adipose tissue and, 211-12  
  collagen and, 375-76  
  dietary fiber and, 315  
  elastin and, 376  
  human milk and, 421-22  
  hyperhomocyst(e)inemia and, 287  
  urea cycle and, 86  
  vitamin C and, 379
- 1,2-Diacylglycerol  
  adipose tissue and, 220
- Diacylphosphatidylcholine  
  gallstones and, 302-4, 306, 310-12, 316
- Diarrhea  
  dietary fiber and, 30
- lactose intolerance and, 13
- N,N*-Dibutylnitrosamines  
  cancer and, 144, 169, 171
- Di-calciphor  
  cellular energy metabolism and, 337
- Dicarboxylates  
  cellular energy metabolism and, 337  
  placental nutrient transport and, 189-90, 196
- 3,4-Didehydroretinoic acid  
  retinol activation and, 50-51
- 3,4-Didehydroretinol  
  retinol activation and, 50
- 3,4-Didehydroretinyl esters  
  retinol activation and, 50
- Diet  
  anticancer, 140-155  
  cellular energy metabolism and, 341  
  cholesterol and, 402-3  
  cobalamin neuropathy and, 60-63, 65, 68, 72  
  gallstones and, 306-17  
  lactational capacity and, 103-15  
  protein-energy malnutrition and, 3  
  urea cycle and, 82, 84-87, 89
- Diethylnitrosamine  
  cancer and, 170
- Dieting  
  gallstones and, 308
- Digestive enzymes  
  food processing and, 123, 126-27
- Diglyceride acyltransferase  
  adipose tissue and, 213
- Digoxin  
  dietary fiber and, 25
- Dihydroacitretin  
  cancer and, 166
- Dihydroretinoic acid  
  cancer and, 165-66
- 3'-Dimethylaminoazobenzene (3'-MeDAB)  
  retinoids and, 163, 170, 174
- 12-Dimethylbenz(a)anthracene (DMBA)  
  carotenoids and, 143  
  retinoids and, 163, 165-69, 172-74  
  structure of, 163  
  vitamin C and, 144  
  vitamin E and, 144
- 16,16-Dimethyl-15-dehydropstaglandin B<sub>1</sub>  
  cellular energy metabolism and, 337
- Dimethylglycine  
  cobalamin neuropathy and, 69



- 1,2-Dimethylhydrazine (DMH)  
 carotenoids and, 143  
 retinoids and, 172  
 vitamin C and, 144
- 2,6-Dimethylnitrosomorphiline (DMNM)  
 cancer and, 169, 171-73
- Dimethylsterol  
 human milk and, 424
- Diphenylamine-2-carboxylate  
 placental nutrient transport and, 198
- Dipyridamole  
 hyperhomocyst(e)inemia and, 285
- Disaccharides  
 chronic diarrhea and, 13  
 dietary fiber and, 28  
 fat substitutes and, 483
- Disulfides  
 hyperhomocyst(e)inemia and, 294
- Diverticulosis  
 dietary fiber and, 31, 315
- DNA  
 antioxidants and, 153  
 carcinogenesis and, 164  
 food processing and, 122  
 retinoic acid-responsive elements and, 38  
 urea cycle and, 91-93
- Dogs  
 adipose tissue and, 215
- Doubly labeled water method  
 milk volume determination and, 418-19
- Drinking water  
 fluorosis and, 12-13
- Drosophila melanogaster*  
 iron-responsive element binding proteins and, 351, 355  
 iron-responsive elements and, 349
- Drugs  
 absorption of  
 dietary fiber and, 25, 27
- Dysplastic nevi  
 retinoids and, 166
- Dyspnea  
 eosinophilia-myalgia syndrome and, 244, 246  
 toxic oil syndrome and, 247
- E
- Edema  
 eosinophilia-myalgia syndrome and, 244, 246  
 toxic oil syndrome and, 248
- EDTA  
 ferritin and, 357
- Eggs  
 antioxidant properties and, 146  
 lactational capacity and, 107
- Eicosanoids  
 gallstones and, 311  
 human milk and, 437
- Elastin  
 diabetes and, 376  
 nutritional emphysema and, 376
- Elderly  
 adipose tissue and, 212  
 cobalamin deficiency and, 72
- Electrolytes  
 space flight and, 264, 267, 269-70
- Electrophilic compounds  
 food processing and, 131
- Elongases  
 human milk and, 436
- Embryo  
 collagen and, 372  
 retinoids and, 174-75  
 retinol-binding protein and, 47  
 vitamin A and, 378  
 white adipose tissue and, 208-10
- Emphysema  
 nutritional  
 collagen metabolism and, 376
- Endoplasmic reticulum  
 chylomicron remnant retinyl esters and, 41  
 collagen and, 373  
 placental nutrient transport and, 194
- Endosomes  
 chylomicron remnant retinyl esters and, 41
- Endothelial cell protein C  
 hyperhomocyst(e)inemia and, 293
- Endotoxin  
 eosinophilia-myalgia syndrome and, 249
- Energy metabolism  
 conformers and, 329-31  
 coordinated multisite regulation and, 341  
 coordination of multisite regulation, 337  
 evidence for multisite regulation, 334-37  
 mitochondrial respiration, 338-40  
 sites of regulation, 331-34  
 perspectives on, 327-28  
 principles of energy regulation and, 328-29
- regulators and, 329-31  
 space flight and, 266-68
- Entactin  
 adipose tissue and, 221
- Enterocytes  
 retinol esterification and, 39-40
- Enterohepatic circulation  
 dietary fiber and, 25-27  
 general physiology of, 300  
 bile acids, 301-4  
 bile secretion, 305-6  
 biliary cholesterol, 305  
 biliary proteins, 305  
 gallstones, 306  
 lecithin, 302, 304
- Enterotoxins  
 human milk and, 423, 433, 435
- Enzyme-linked immunosorbent assay (ELISA)  
 food processing and, 125
- Enzymes  
 arginine synthesis and, 82-83, 87-90, 95  
 cobalamin neuropathy and, 61, 63-67  
 dietary fiber and, 27-29, 33  
 food processing and, 126-27, 129, 132  
 human milk and, 428  
 marasmus and, 5  
 retinoic acid synthesis and, 51  
 urea synthesis and, 81-87, 90-95
- Eosinophilia-myalgia syndrome  
 animal models of, 248-49  
 clinical and pathological features of, 131, 244-46  
 epidemiologic studies and, 239-42  
 history of, 235-36  
 in vitro studies of, 249  
 national surveillance data and, 238-39  
 natural history and treatment of, 246-47  
 pathogenetic mechanisms of, 250-52  
 risk factors for, 242-44  
 toxic oil syndrome and, 246-48, 251
- Eosinophilic fasciitis  
 eosinophilia-myalgia syndrome and, 245-46, 251
- Eosinophil peroxidase  
 eosinophilia-myalgia syndrome and, 250
- Epidermal growth factor (EGF)  
 adipose tissue and, 222



- Epidermis  
acyl CoA:retinol acyltransferase and, 50
- Epididymal-binding proteins  
retinoic acid transport and, 47
- 5,6-Epoxy-retinoic acid  
cancer and, 165
- Erythrocytes  
pellagra and, 11  
placental nutrient transport and, 194
- Escherichia coli*  
enterotoxin from  
in human milk, 435
- Esophageal cancer  
 $\beta$ -carotene and, 154  
cholesterol and, 405  
retinoids and, 173-74  
vitamin E and, 154
- Essential fatty acids (EFAs)  
gallstones and, 309, 311, 314-15, 317  
human milk and, 435-36
- Esterase  
adipose tissue and, 211
- Estradiol  
adipose tissue and, 221, 225
- Estrogens  
adipose tissue and, 214, 224-26  
hyperhomocyst(e)inemia and, 283  
retinoids and, 169
- Estrone  
adipose tissue and, 225
- Ethanol  
placental nutrient transport and, 184
- Ethanolamine  
placental nutrient transport and, 190
- Ethyl carbamate  
cancer and, 169
- 1,1'-Ethylidenebis(tryptophan  
structure of, 242  
tryptophan contamination and, 241-42, 249-51
- Ethyl nitrosourea  
cancer and, 169
- N-Ethylretinamide  
cancer and, 170-71
- Ethyl retinoate  
cancer and, 166
- Etretinate  
cancer and, 166-68, 170-73, 175  
structure of, 162
- Europe  
cancer risk and, 394-97  
eosinophilia-myalgia syndrome and, 236
- human milk composition and, 429  
infant formulas and, 432
- Exercise  
cellular energy metabolism and, 340-41  
protein-calorie malnutrition and, 6  
space flight and, 264-66, 268
- Extracellular matrix  
adipose tissue and, 211, 223  
collagen and, 370-74
- F
- Factor V  
hyperhomocyst(e)inemia and, 293-94
- Factor VII  
hyperhomocyst(e)inemia and, 293-94
- fa gene  
adipose tissue and, 225
- Fasting  
collagen metabolism and, 375  
gallstones and, 308, 318
- Fatigue  
eosinophilia-myalgia syndrome and, 246-47
- Fats, dietary  
cancer risk and, 401, 410-11  
dietary fiber and, 26-27, 32  
gallstones and, 310-12  
human milk and, 419-37  
space flight and, 267  
substitutes for, 473-75  
through chemical synthesis, 482-84  
food labeling and, 485-86  
from novel sources, 484  
safety requirements and, 476-81  
total diet perspective and, 484-85  
from traditional food sources, 481-82
- Fatty acids  
adipose tissue and, 213, 218, 225-26  
C15, 65  
C17, 65  
cobalamin neuropathy and, 63-66  
dietary fiber and, 25, 27-29, 31  
fat substitutes and, 480, 483  
food processing and, 128  
gallstones and, 308-12, 314-15, 317-19  
human milk and, 421-28, 434-37  
infant formulas and, 432-33
- inter-photoreceptor retinoid-binding protein and, 46  
lactational capacity and, 106-7  
n-3, 311  
oxidative damage and, 142  
placental nutrient transport and, 190  
reactive oxygen species and, 140  
toxic oil syndrome and, 248
- Fatty acid synthetase  
adipose tissue and, 213
- Feces  
bile acids and, 26  
cobalamin neuropathy and, 60  
dietary fiber and, 27-31, 33  
space flight and, 264, 267-68
- Federal regulation  
of dietary fats, 473-86
- Fermentation  
cecal  
dietary fiber and, 26-29
- Ferric oxide  
cancer and, 169, 172
- Ferritin  
placental nutrient transport and, 198  
receptor  
iron-responsive element binding proteins and, 346-50, 353-63  
space flight and, 270
- Ferro orthophosphate  
iron fortification and, 9
- Ferrous sulphate  
iron fortification and, 9
- Fetal nutrition  
placental nutrient transport and, 184-200
- Fever  
eosinophilia-myalgia syndrome and, 244  
toxic oil syndrome and, 247  
vitamin A toxicity and, 6
- Fiber, dietary  
antioxidant chemical properties of, 140  
carbohydrates and, 19-20  
cecal fermentation and, 26-29  
gallstones and, 313-17  
intestinal absorption rate and, 23-25  
intraluminal effects and, 31-33  
physical properties of, 22-23  
plant structure and chemistry, 20-22  
quantitative measurement of, 23  
space flight and, 271

- sterol metabolism alteration and, 25-26
- stool weight and, 29-31
- Fibrinogen
  - hyperhomocyst(e)inemia and, 287
- Fibroblast collagenase
  - collagen and, 374
- Fibroblast growth factor (FGF)
  - adipose tissue and, 222
  - collagen metabolism and, 380
- Fibronectin
  - collagen metabolism and, 372, 375
  - eosinophilia-myalgia syndrome and, 244
  - vitamin A and, 378
- Fibrosis
  - hyperhomocyst(e)inemia and, 284
- Fish
  - iron-responsive element binding proteins and, 351
- Fish oil
  - gallstones and, 311
- Flavin adenine dinucleotide (FAD)
  - placental nutrient transport and, 191
- Flavin mononucleotide (FMN)
  - placental nutrient transport and, 191
- Fluids
  - space flight and, 269-70
- Fluorinated aromatic retinoids
  - cancer and, 166
- Fluorosis
  - endemic
    - in India, 12-13
- Folate
  - cobalamin neuropathy and, 61, 63, 69, 74
  - hyperhomocyst(e)inemia and, 282-83, 285, 293-94
  - placental nutrient transport and, 191
- Folic acid
  - space flight and, 270
- Fontanelles
  - bulging
    - vitamin A toxicity and, 6
- Food additives
  - dietary fiber and, 27
- Food allergenicity
  - food processing and, 125-26, 133
- Food and Drug Administration (FDA)
  - fat substitute regulation and, 475-79, 481-86
- Food processing
  - adverse effect prevention and, 131-33
- amino acid bioavailability
  - and, 127-31
- heat and, 123-27, 132-33
- pH and, 120-23, 132
- types of, 119-20
- Formamidase
  - tryptophan and, 238
- Formate
  - cobalamin neuropathy and, 74, 76
- N-Formylkynurenine
  - tryptophan and, 237-38
- Forskolin
  - adipose tissue and, 220
- Free fatty acids (FFAs)
  - human milk and, 435
- Free radicals
  - antioxidants and, 140
  - food processing and, 127, 131
  - hyperhomocyst(e)inemia and, 293
  - vitamin C and, 379
- Fruit bat
  - cobalamin neuropathy and, 60-62, 66-73, 75
- Fruits
  - antioxidant properties and, 146
  - cancer risk and, 141-42, 147-48, 153-55
  - cobalamin neuropathy and, 62
  - dietary fiber and, 20, 24
  - food processing and, 132
  - space flight and, 271
- Fucose
  - dietary fiber and, 22
- Fucosyl units
  - dietary fiber and, 21
- Fumarate
  - placental nutrient transport and, 190
- G
  - Galactomannan
    - dietary fiber and, 21
  - Galactose
    - dietary fiber and, 21-22
    - gallstones and, 314
  - Galactoxyluronic groups
    - dietary fiber and, 21
  - Galacturonic acid
    - dietary fiber and, 22
  - Galacturonohamnose
    - dietary fiber and, 21
  - Gallbladder
    - bile acids and, 301
    - cancer
      - cholesterol and, 399
  - Gallstones
    - animal models and, 317-19
  - biliary lipid homeostasis and, 306-17
  - diet and, 306-17
  - enterohepatic circulation and, 300-6
  - Gangliosides
    - human milk and, 423
    - infant formulas and, 433, 435
  - Gas-liquid chromatography (GLC)
    - dietary fiber and, 23
    - human milk and, 419-20, 423-24
  - Gastrectomy
    - cobalamin neuropathy and, 63
  - Gastric dysplasia
    - $\beta$ -carotene and, 143
  - Gastric emptying
    - dietary fiber and, 23-24
  - Gelatin
    - fat substitutes and, 481
  - Gellan
    - dietary fiber and, 31
  - Gemfibrozil
    - cholesterol and, 402
  - Gender
    - adipose tissue and, 211-12, 214
    - cellular energy metabolism and, 340
    - iron metabolism and, 354
  - Genes
    - adipose tissue and, 217-19, 222-26
    - cancer risk and, 407
    - cellular energy metabolism and, 339
    - cholesterol and, 410
    - collagen, 371-72, 378-80
    - ferritin, 349
    - hyperhomocyst(e)inemia and, 287, 292
    - iron homeostasis and, 346-64
    - lactational capacity and, 105
    - oxidative damage and, 142
    - phosphoenolpyruvate carboxykinase, 92
    - urea cycle and, 82, 90-94
    - vitamin A and, 38, 443-63
  - Genotoxicity
    - food processing and, 133
  - Genu-valgum
    - fluorosis and, 13
  - Globule membrane
    - milk fat globule emulsion and, 428
  - Glucagon
    - urea cycle and, 85-87
  - Glucans
    - dietary fiber and, 20-22
  - Glucocorticoids
    - adipose tissue and, 212, 214, 220-21, 223

- collagen synthesis and, 372  
 eosinophilia-myalgia syndrome and, 247  
 tryptophan and, 237-38, 243  
 urea cycle and, 84-86, 88-89, 91-92, 94
- Gluconate**  
 food processing and, 125
- Glucose**  
 cellular energy metabolism and, 338-39  
 dietary fiber and, 22, 24  
 food processing and, 124-26  
 gallstones and, 314  
 placental nutrient transport and, 185-86, 190  
 space flight and, 268
- $\beta$ -Glucosidase**  
 dietary fiber and, 29
- Glucuronic acid**  
 dietary fiber and, 21
- $\beta$ -Glucuronidase**  
 dietary fiber and, 29
- Glucuronide**  
 dietary fiber and, 27
- Glutamate**  
 food processing and, 125  
 placental nutrient transport and, 188  
 toxicity of, 188
- Glutamic acid**  
 food processing and, 128
- Glutamine**  
 placental nutrient transport and, 186  
 urea cycle and, 82, 95
- Glutamine synthetase**  
 adipose tissue and, 213
- Glutamyllysine**  
 food processing and, 128-29
- Glutathione**  
 antioxidant activity and, 140  
 food processing and, 127, 131-32  
 iron-responsive element binding proteins and, 361
- Glutathione peroxidase**  
 antioxidant activity and, 140
- Gluten**  
 food processing and, 124-25, 127, 129
- GLUT tissue glucose transporters**  
 adipose tissue and, 213, 217, 220  
 placental nutrient transport and, 185
- Glycerol**  
 human milk and, 419
- Glycerolipids**  
 adipose tissue and, 218  
 cobalamin neuropathy and, 65
- Glycerol-3-phosphate dehydrogenase (GPDH)**  
 adipose tissue and, 211, 213, 217-23
- Glycerophosphate acyltransferase**  
 adipose tissue and, 213
- Glycine**  
 5'-aminolevulinic synthase and, 356  
 bile acids and, 301  
 collagen and, 370  
 gallstones and, 302, 304, 311, 313-14, 316-17
- Glycochenodeoxycholate**  
 function of, 301
- Glycocholate**  
 gallstones and, 314
- Glycodeoxycholate**  
 function of, 301  
 gallstones and, 302
- Glycogen**  
 space flight and, 268-69
- Glycoproteins**  
 gallstones and, 305  
 placental nutrient transport and, 198
- Glycosaminoglycans**  
 vitamin C and, 378
- Glycyl-glycine**  
 food processing and, 132
- GM1 ganglioside**  
 infant formulas and, 433, 435
- Goiter**  
 endemic in India, 9-10
- Golgi complex**  
 chylomicron remnant retinyl esters and, 41  
 collagen and, 373
- Granulocyte-macrophage colony-stimulating factor (GM-CSF)**  
 eosinophilia-myalgia syndrome and, 249-50
- Granulocytes**  
 retinoic acid and, 164
- Grapefruit**  
 antioxidant properties and, 146  
 food processing and, 132
- Grape juice**  
 food processing and, 132
- Gravimetric chromatography**  
 dietary fiber and, 23
- Greens**  
 antioxidant properties and, 146  
 nutritional blindness and, 7
- Ground squirrels**  
 gallstones and, 318
- Growth factors**  
 collagen synthesis and, 372  
 human milk and, 428
- Growth hormone (GH)**  
 adipose tissue and, 212, 219-20  
 kwashiorkor and, 4  
 marasmus and, 4  
 protein-calorie malnutrition and, 4  
 urea cycle and, 87
- GTPase**  
 hepatic retinoids and, 170
- Guar gum**  
 dietary fiber and, 21, 24, 30  
 fat substitutes and, 481
- Guinea pigs**  
 collagen metabolism and, 375  
 placental nutrient transport and, 191, 195, 199  
 white adipose tissue and, 209
- Gum arabic**  
 dietary fiber and, 21, 26, 28
- Gum karaya**  
 dietary fiber and, 21
- Gum tragacanth**  
 dietary fiber and, 22
- ## H
- H<sup>+</sup>**  
 dietary fiber and, 21, 26-29  
 placental nutrient transport and, 189, 195-97
- Halogens**  
 tryptophan and, 131
- Hamsters**  
 adipose tissue and, 215  
 collagen metabolism and, 377  
 gallstones and, 302, 309, 311-19  
 high-density lipoprotein and, 302  
 lactational capacity and, 106-7  
 retinoids and, 170-74
- Harmaline**  
 placental nutrient transport and, 196
- Headache**  
 eosinophilia-myalgia syndrome and, 244  
 toxic oil syndrome and, 247
- Head cancer**  
 retinoids and, 162, 167
- Heart rate**  
 space flight and, 264
- Heat**  
 food processing and, 123-27, 132-33
- HeLa cells**  
 urea cycle and, 89
- Hemagglutinins**  
 food processing and, 127

- Hematological changes  
space flight and, 260
- Heme  
5'-aminolevulinatase synthase and, 349, 356-57  
iron-responsive element binding proteins and, 363
- Hemicellulose  
dietary fiber and, 20-21  
fat substitutes and, 481
- Hemin  
5'-aminolevulinatase synthase and, 357
- Hemodexocholic acid  
gallstones and, 319
- Hemorrhagic disease  
neonatal  
vitamin E deficiency and, 432
- Hepatocytes  
dietary fiber and, 26  
retinol and, 48  
urea cycle and, 82, 84-86, 90
- Herbivores  
dietary fiber and, 28
- HGM-CoA reductase  
cancer risk and, 409-10
- High-carbohydrate diets  
adipose tissue and, 211-12
- High-density lipoprotein (HDL)  
cancer risk and, 401, 406-7  
gallstones and, 302-4, 307-10, 313-14, 318
- High-fat diets  
adipose tissue and, 211-12  
human milk and, 420-22  
lactational capacity and, 106
- High-pressure liquid chromatography (HPLC)  
human milk and, 429, 431-32  
tryptophan and, 241
- High-protein diets  
urea cycle and, 84
- Histidine  
food processing and, 123  
placental nutrient transport and, 186
- HIV  
see Human immunodeficiency virus
- HLA-DR  
eosinophilia-myalgia syndrome and, 250
- HMG-CoA reductase  
bile lipids and, 303
- Homeostasis  
biliary lipid  
gallstones and, 306-17  
bone  
collagen metabolism and, 381-83  
iron, 346-64  
retinol and, 44-46  
urea cycle and, 82, 95
- Homocysteine  
cobalamin neuropathy and, 62, 69-71, 73-74  
metabolism of, 281  
occlusive vascular disease and, 279-95  
toxicity of, 280  
N-Homocysteine thiolactonyl retinamide  
cancer and, 169  
N-Homocysteine thiolactonyl retinamido cobalamin  
cancer and, 169
- Hormones  
adipose tissue and, 212-14, 218, 220-21, 224-26  
dietary fiber and, 27  
human milk and, 428  
placental nutrient transport and, 184, 190  
protein-calorie malnutrition and, 4  
tryptophan and, 237  
urea cycle and, 82, 85-89, 91-92, 94
- Hormone-sensitive lipase  
adipose tissue and, 213
- hsp47 heat shock glycoprotein  
collagen metabolism and, 373
- Human immunodeficiency virus (HIV)  
human milk and, 435
- Hydrochloric acid  
dietary fiber and, 22
- Hydrocortisone  
urea cycle and, 89
- Hydrogen peroxide  
hyperhomocyst(e)inemia and, 292-94
- Hydroxyanisole  
butylated  
cancer and, 172
- 3-Hydroxyanthralinic acid  
tryptophan and, 238
- $\beta$ -Hydroxybutyrate  
placental nutrient transport and, 189
- Hydroxychloroquine  
eosinophilia-myalgia syndrome and, 247
- N-(2-Hydroxyethyl)retinamide  
cancer and, 165, 171, 175
- 5-Hydroxyindoleacetic acid (5-HIAA)  
tryptophan and, 238
- 3-Hydroxykynurenine  
tryptophan and, 238
- Hydroxylase  
gallstones and, 301, 303  
tryptophan and, 238
- Hydroxyl radicals  
hyperhomocyst(e)inemia and, 293
- $\beta$ -Hydroxymethylglutamate (HMG)  
cholesterol and, 409
- N-(4-Hydroxyphenyl)retinamide (4HPR)  
cancer and, 165, 168-75  
structure of, 162
- Hydroxyproline  
collagen and, 370, 373, 375  
space flight and, 264
- 4-Hydroxyretinol  
retinol activation and, 50
- Hydroxysteroid dehydrogenase  
adipose tissue and, 225
- 5-Hydroxytryptamine  
pellagra and, 11
- Hydroxytryptophan  
metabolism of, 238
- Hypergammaglobulinemia  
eosinophilia-myalgia syndrome and, 245
- Hyperhomocyst(e)inemia  
classification of, 280-81  
etiology of, 281  
occlusive vascular disease and, 279-95
- Hyperinsulinemia  
gallstones and, 307
- Hyperlipidemia  
hyperhomocyst(e)inemia and, 287
- Hypertension  
pulmonary  
toxic oil syndrome and, 247
- Hyperthyroidism  
adipose tissue and, 212
- Hypoparathyroidism  
parathyroid hormone and, 383
- Hypophysectomy  
urea cycle and, 87
- Hypothalamic-pituitary-adrenal (HPA) axis  
tryptophan and, 237, 243-44
- Hypothyroidism  
adipose tissue and, 212  
neonatal chemical  
endemic goiter and, 10
- Hypovitaminosis A  
keratomalacia and, 6-8
- I
- ICI D7114  
adipose tissue and, 215
- IgA  
gallstones and, 305
- IgE  
eosinophilia-myalgia syndrome and, 244

- food processing and, 126
- IgM
  - gallstones and, 305
- Ileum
  - dietary fiber and, 25-27
- Immune system
  - antioxidants and, 142, 153
  - food processing and, 125-26, 133
  - human milk and, 435
  - retinoids and, 164
  - tumor surveillance and, 142
- Immunoglobulin heavy chain-binding protein
  - collagen metabolism and, 373
- India
  - endemic goiter and, 9-10
  - fluorosis and, 12-13
  - iron deficiency anemia and, 8-9
  - keratomalacia and, 6-8
  - lactose intolerance and, 13-14
  - lathyrism and, 11-12
  - major nutritional problems and, 2
  - nutritional blindness and, 6-8
  - pellagra and, 10-11
  - protein-energy malnutrition and, 2-6
- Indian
  - tryptophan and, 238
- Indole
  - tryptophan and, 238
- Indole acetic acid
  - tryptophan and, 238
- Indoleamine 2,3-dioxygenase
  - tryptophan and, 237-38
- Indole pyruvic acid
  - tryptophan and, 238
- Indomethacin
  - adipose tissue and, 220-21
- Infants
  - formula feeding and, 432-33, 437
  - allergic response to, 126
  - cholesterol and, 424
  - lipids and, 432-33, 437
  - hemorrhagic disease and, 432
  - human milk and, 418-37
  - maternal lactational capacity and 103-15
- Inositol
  - placental nutrient transport and, 190
- Insulin
  - adipose tissue and, 212-13, 218-21, 223, 226
  - gallstones and, 307, 316
  - placental nutrient transport and, 185, 187-88, 195
  - urea cycle and, 84-86, 94
- Insulin-like growth factor I (IGF-I)
  - adipose tissue and, 210, 212-13, 216, 219-20, 223
- Interferon
  - collagen synthesis and, 372
  - tryptophan and, 237, 246
  - vitamin D and, 381
- Interleukin 1 (IL-1)
  - collagen and, 374
- Interleukin 3 (IL-3)
  - eosinophilia-myalgia syndrome and, 250
- Interleukin 5 (IL-5)
  - eosinophilia-myalgia syndrome and, 249-50
- Intermediate-density lipoprotein (IDL)
  - gallstones and, 302, 307
- Inter-photoreceptor retinoid-binding protein (IRBP)
  - vitamin A transport and, 46
- Intestinal tract
  - bile acids and, 301
  - dietary fiber absorption and, 23-25, 27, 31-33
  - gallstones and, 315
  - human milk and, 433-34
  - retinoic acid synthesis and, 51
  - urea cycle and, 82, 87-88, 93
  - vitamin A and, 38-41
  - vitamin D and, 380
- Intimal hyperplasia
  - hyperhomocyst(e)inemia and, 284
- Intracranial tension
  - vitamin A toxicity and, 6
- Intracrine steroid formation
  - adipose tissue and, 225
- Iodide
  - placental nutrient transport and, 198-99
- Iodine
  - fortification and, 9-10
- Ion transport
  - placental nutrient transport and, 193-99
- Iron
  - complex carbohydrates and, 25
  - placental nutrient transport and, 197-98
  - space flight and, 270-71
- Iron deficiency anemia
  - in India
    - iron fortification and, 8-9
- Iron-responsive element binding proteins (IRE-BP)
  - perspectives on, 345-46
  - translational regulation and, 349-60
- Irritable bowel syndrome
  - dietary fiber and, 31
- Ischemia
  - eosinophilia-myalgia syndrome and, 245, 250
- Isobutyrate
  - dietary fiber and, 28
- Isocitrate
  - aconitase and, 352
  - cellular energy metabolism and, 338-39
- Isocitrate dehydrogenase
  - cellular energy metabolism and, 334
- Isoleucine
  - cobalamin neuropathy and, 64, 66-67
- Isoleucine
  - food processing and, 126-27
- Isoprenyl pyrophosphate
  - cholesterol and, 409
- Isovalerate
  - dietary fiber and, 28
- Ispaghula
  - dietary fiber and, 31
- Israel
  - cancer risk and, 395
- J
  - Japan
    - cancer risk and, 394
  - Jejunum
    - urea cycle and, 88
  - Jojoba oil
    - fat substitutes and, 484
  - Jowar
    - pellagra and, 10
  - jv mice
    - urea cycle and, 93
- K
  - K<sup>+</sup>
    - placental nutrient transport and, 188, 196-97
    - space flight and, 263, 268, 271
  - KB cells
    - urea cycle and, 89
  - Keratin
    - vitamin A and, 377
  - Keratinocytes
    - retinol and, 49
  - Keratomalacia
    - in India, 6-8
  - Keratinosis
    - retinoids and, 162, 167, 174
  - Ketaconazole
    - retinoic acid synthesis and, 51
  - Ketoisocaproic acid
    - space flight and, 269
  - Kidneys
    - adipose tissue and, 212

- cancer of
  - carotenes and, 148
- chylomicron remnant retinyl esters and, 40
- collagen and, 374
- food processing and, 122-23, 129
- hyperhomocyst(e)inemia and, 283-84
- plasma retinol homeostasis and, 46
- retinoic acid synthesis and, 51
- retinoids and, 172-73
- space flight and, 269-70
- urea cycle and, 82, 88-89, 93
- vitamin D and, 380
- Krebs cycle
  - aconitase and, 349, 352
- Kunitz soybean trypsin inhibitor
  - food processing and, 125-26
- Kwashiorkor
  - protein-calorie malnutrition and, 3-5
- Kynurenic acid
  - pellagra and, 11
- Kynureninase
  - pellagra and, 11
  - tryptophan and, 238
- Kynurenine
  - tryptophan and, 237-38, 246, 251
- L
- Labeling
  - food
    - fat substitutes and, 485-86
- Lactase
  - for lactose intolerance, 14
- Lactate
  - placental nutrient transport and, 189-90, 197
- Lactation
  - lipids and, 418-37
  - maternal nutrition and, 103-15
  - retinol and, 50
- Lactic acid
  - placental nutrient transport and, 189
- Lactose
  - cancer risk and, 403
  - food processing and, 125
  - gallstones and, 314-15
  - human milk and, 419-20, 423
  - intolerance of, 13-14
  - lactational capacity and, 106, 110
- Lactulose
  - gallstones and, 316
- Lambs
  - adipose tissue and, 223
- Lamina propria
  - tryptophan and, 249
- Laminin
  - adipose tissue and, 221
- Lanosterol
  - cholesterol and, 410
  - human milk and, 424
- Lanthionine
  - food processing and, 128
- Larynx cancer
  - cholesterol and, 405
- Lathosterol
  - human milk and, 424
- Lathyrism
  - in India, 11-12
- L cells
  - urea cycle and, 89
- LDL receptor-like protein
  - gallstones and, 302-4
- Lead
  - placental nutrient transport and, 199
- Leaves
  - dietary fiber and, 20
- Lecithin
  - gallstones and, 300, 302-4, 306, 310-12, 316
  - infant formulas and, 432
- Lecithin:retinol acyltransferase
  - retinoids and, 39, 42, 45, 48, 50, 52
- Lectins
  - food processing and, 127
- Legumes
  - food processing and, 129
  - protein-calorie malnutrition and, 3
- Lettuce
  - antioxidant properties and, 146
- Leucine
  - cobalamin neuropathy and, 67-68
  - pellagra and, 11
  - placental nutrient transport and, 186-87
  - space flight and, 269
  - urea cycle and, 90
- Leukemia
  - cholesterol and, 405, 410
  - chylomicron remnant retinyl esters and, 41
  - retinoic acid nuclear receptors and, 460-61
  - retinoids and, 162, 164, 167-68, 173
- Leukoplakia
  - retinoids and, 162, 167
- Leukotriene C4
  - eosinophilia-myalgia syndrome and, 250
- Light
  - tryptophan induction and, 131
- Lignin
  - dietary fiber and, 20, 23
- gallstones and, 316
- Lima bean flour
  - food processing and, 127
- Linoleic acid
  - cancer risk and, 407
  - gallstones and, 304, 311-12
- Lipases
  - fat substitutes and, 483
  - human milk and, 433-35
- Lipid peroxidation
  - collagen metabolism and, 380
  - hyperhomocyst(e)inemia and, 293
- Lipids
  - antioxidants and, 153
  - dietary fiber and, 25
  - food processing and, 133
  - gallstones and, 306-17
  - in human milk
    - absorption of, 433-35
    - classes of, 422-24
    - determination of, 419-20
    - factors affecting, 420-22
    - fat content, 419
    - fat-soluble vitamins, 428-32
    - fatty acids, 424-28
    - host defense effects of, 435
    - milk fat globule emulsion and membranes, 428
    - polyunsaturated fatty acids, 435-36
    - trans fatty acids, 436
    - volume of, 418-19
  - infant formulas and, 432-33, 437
  - placental nutrient transport and, 190
- Lipoprotein lipase
  - adipose tissue and, 210, 212-13, 216-19, 221-22, 224, 226
  - placental nutrient transport and, 190
- Lipoproteins
  - gallstones and, 306-10
  - placental nutrient transport and, 192
- Lithocholic acid
  - formation of, 301
- Lithogenic index
  - gallstones and, 307, 312, 317
- Liver
  - bile acids and, 301
  - cancer
    - retinoids and, 162, 170
  - cobalamin neuropathy and, 72, 75
  - collagen and, 370, 374
  - dietary fiber and, 26-27, 29
  - gallstones and, 302-3, 307, 309-13, 315-17

- iron-responsive element binding proteins and, 351-52, 354, 363
- protein-calorie malnutrition and, 4-5
- retinoids and, 40-43, 46, 48, 51
- space flight and, 268
- urea cycle and, 82-87, 89-92, 94
- vitamin A and, 38, 377-78
- Long-chain fatty acids
  - fat substitutes and, 483
  - lactational capacity and, 106-7
- Lovastatin
  - gallstones and, 307, 312
- Low-density lipoprotein (LDL)
  - cancer risk and, 399, 406-7, 410
  - chylomicron remnant retinyl esters and, 41
  - gallstones and, 302, 304, 307-10, 313-14, 316
  - hyperhomocyst(e)inemia and, 293
  - placental nutrient transport and, 190
  - vitamin A transport and, 48
- Low-fat diets
  - human milk and, 422
- Low Km phosphodiesterase
  - adipose tissue and, 213
- Low-protein diets
  - urea cycle and, 84
- L system
  - placental nutrient transport and, 186-87
- Lungs
  - cancer of
    - antioxidants and, 141
    - $\beta$ -carotene and, 147-48, 151-52, 154
    - cholesterol and, 394-95, 397-98, 404-5, 410
    - retinoids and, 162, 165, 169-70, 174
    - vitamin C and, 150-52
    - vitamin E and, 151-52, 154
  - collagen metabolism and, 372, 376
  - eosinophilia-myalgia syndrome and, 245-46
  - retinoic acid synthesis and, 51
  - toxic oil syndrome and, 247
- Lutein
  - human milk and, 429
- Lycopene
  - human milk and, 429
- Lymphoma
  - cholesterol and, 405
  - retinoids and, 164, 167-68
- Lysine
  - food processing and, 121-23, 126-29, 131
  - placental nutrient transport and, 188
- Lysine hydrochloride
  - food processing and, 128
- Lysinoalanine
  - food processing and, 121-23, 128
- Lysophosphatidate acyltransferase
  - adipose tissue and, 213
- Lysosomal enzymes
  - keratomalacia and, 7
- Lysosomes
  - placental nutrient transport and, 190
- M
- Macrophages
  - urea cycle and, 95
- Magnetic resonance imaging (MRI)
  - cobalamin neuropathy and, 72
- Maillard reactions
  - dietary fiber and, 23
  - food processing and, 123-24, 126, 128
- Maize
  - pellagra and, 10-11
  - tryptophan and, 131
- Major basic protein
  - eosinophilia-myalgia syndrome and, 250
- Malaise
  - toxic oil syndrome and, 247
- Malate
  - placental nutrient transport and, 190
- Malic enzyme
  - adipose tissue and, 213
- Malnutrition
  - in India, 2-14
  - lactational capacity and, 103-5, 109-14
- Malonyl CoA
  - cobalamin neuropathy and, 63, 65
- Maltodextrins
  - fat substitutes and, 481
- Maltose
  - food processing and, 125
- Manganese
  - urea cycle and, 85
- Marasmus
  - protein-calorie malnutrition and, 3-5
- Margarine
  - antioxidant properties and, 145-46
- Mass spectrometry
  - human milk and, 424
- Mayonnaise
  - antioxidant properties and, 146
- Medial hyperplasia
  - hyperhomocyst(e)inemia and, 284
- Medium-chain fatty acids
  - lactational capacity and, 106-7
- Melanoma
  - malignant
    - retinoids and, 166
- Membrane transport
  - placenta and, 184-200
- Memory loss
  - eosinophilia-myalgia syndrome and, 246
- Men
  - adipose tissue and, 212, 214, 225
  - cancer risk and, 394-95, 397-405, 407, 408-410
  - gallstones and, 310, 312, 319
  - iron-deficiency anemia and, 8
  - tryptophan and, 237
- Menaquinones
  - human milk and, 432
- Menopause
  - adipose tissue and, 214
  - collagen metabolism and, 376
- Mental retardation
  - cobalamin neuropathy and, 67
  - endemic goiter and, 10
- Mercury
  - placental nutrient transport and, 199
- Messenger RNA (mRNA)
  - aconitase, 349-50, 355
  - adipose tissue and, 221-23
  - 5'-aminolevulinate synthase, 356-57
  - calcium transport ATPase, 195
  - ferritin, 346, 348-50, 353-56, 358-59
  - insulin-like growth factor I, 210, 212, 216
  - lipoprotein lipase, 212, 216-17
  - retinol-binding protein, 43-44
  - transferrin, 348-50, 355, 357-59
  - uncoupling protein, 215
  - urea cycle enzyme, 84-90, 93-94
- Metabolism
  - collagen, 370-83
  - energy, 327-41
  - nitrogen, 85
  - retinoid, 461
  - retinol, 49-52
  - sterol, 25-26



- vitamin A, 14  
 Metalloproteinases  
   collagen metabolism and,  
   374, 381  
 Methane  
   breath test  
   dietary fiber and, 27-28  
 Methionine  
   cobalamin neuropathy and,  
   62, 67-70  
   food processing and, 129-31  
   gallstones and, 317  
   homocysteine metabolism  
   and, 279-80  
   hyperhomocyst(e)inemia and,  
   281-82, 286, 288-91,  
   293  
 Methionine adenosyltransferase  
   cycloleucine and, 68  
 Methionine synthase  
   hyperhomocyst(e)inemia and,  
   281-83  
 Methionine synthetase  
   cobalamin neuropathy and,  
   61, 72-74  
 Methosterol  
   human milk and, 424  
 Methotrexate  
   eosinophilia-myalgia syn-  
   drome and, 247  
   placental nutrient transport  
   and, 191  
*N*-(4-Methoxyphenyl)retinamide  
   cancer and, 165  
 Methylaminoisobutyric acid  
   placental nutrient transport  
   and, 186-87  
 Methylation  
   cobalamin neuropathy and,  
   67-76  
   urea cycle and, 94  
 3-Methylcholanthrene  
   retinoids and, 166  
 Methylcobalamin  
   cobalamin mutants and, 72  
   hyperhomocyst(e)inemia and,  
   283  
 5,10-Methylenetetrahydrofolate  
   deficiency of, 70  
 Methylenetetrahydrofolate reduc-  
   tase  
   hyperhomocyst(e)inemia and,  
   282, 284  
 3-Methylhistidine  
   space flight and, 263, 268  
 1-Methyl-3-isobutylxanthine adi-  
   pose tissue and, 219-21  
 Methylmalonic acid  
   cobalamin neuropathy and,  
   64-67  
 Methylmalonyl CoA  
   cobalamin neuropathy and,  
   61-65  
 Methylmalonyl CoA mutase  
   cobalamin neuropathy and,  
   63-67  
 Methylmercury-demethylase  
   dietary fiber and, 29  
*N*'-Methylnicotinamide  
   tryptophan and, 238  
*N*-Methyl-*N*'-nitro-*N*-  
   nitrosoguanidine  
   carotenoids and, 143  
   retinoids and, 165  
 Methylnitrosourea  
   cancer and, 168-69, 171-72  
   retinoids and, 163  
*N*'-Methyl-2-pyridone-5-  
   carboxamide  
   tryptophan and, 238  
 5-Methyltetrahydrofolate  
   cobalamin neuropathy and,  
   61-62, 69-70  
   hyperhomocyst(e)inemia and,  
   282  
   placental nutrient transport  
   and, 191  
 5-Methyltetrahydrofolate  
   homocysteine methyltrans-  
   ferase  
   cobalamin neuropathy and, 61  
   hyperhomocyst(e)inemia and,  
   281-83  
 5-Methylthioribose  
   cobalamin neuropathy and, 74  
 Methyltransferases  
   cobalamin neuropathy and, 73  
 Mevalonate  
   cholesterol and, 410  
 Mevalonic acid  
   cholesterol and, 409  
 Mezeirein  
   retinoids and, 166  
 $Mg^{2+}$   
   complex carbohydrates and,  
   25  
   placental nutrient transport  
   and, 195  
   space flight and, 271  
 Mice  
   adipose tissue and, 211, 215-  
   16, 223-25  
   carotenoids and, 143  
   collagen metabolism and, 377  
   food processing and, 121-22,  
   124-25, 127-30  
   gallstones and, 311, 313, 319  
   iron-responsive element bind-  
   ing proteins and, 351  
   iron-responsive elements and,  
   349-50  
   placental nutrient transport  
   and, 188  
   retinoids and, 165-74  
   vitamin C and, 144  
   vitamin E and, 144  
   white adipose tissue and, 208  
 Microgravity  
   effects of  
   nutrition as countermeasure  
   to, 259-66  
 Micronutrients  
   protective  
   human cancer and, 139-55  
 Milk  
   allergenic response and, 126  
   antioxidant properties and,  
   146  
   breast  
   fat-soluble vitamins and,  
   428-32  
   lipids in, 418-37  
   maternal nutritional status  
   and, 103-15  
   nutritional aspects of, 433-  
   36  
   lactose intolerance and, 13-14  
   marasmus and, 3  
   nonfat dry  
   food processing and, 132  
   retinol and, 50  
   space flight and, 270  
 Millet sorghum  
   pellagra and, 10-11  
 Mineral oil  
   fat substitutes and, 484  
 Minerals  
   cobalamin neuropathy and, 60  
   collagen metabolism and,  
   381-83  
   dietary fiber and, 25  
   placental nutrient transport  
   and, 193-99  
   space flight and, 266, 269-70  
 Mitochondria  
   aconitase and, 352  
   adipose tissue and, 215  
   respiration in  
   coordinated multisite regu-  
   lation and, 338-40  
   urea cycle and, 82  
 Mitosis  
   food processing and, 122  
 $Mn^{2+}$   
   urea cycle and, 84, 86  
 Moloney murine sarcoma virus  
   retinyl palmitate and, 172  
 Molybdate  
   placental nutrient transport  
   and, 199  
 Molybdenum  
   fluorosis and, 13  
 Monkeys  
   cobalamin neuropathy and,  
   60-62, 68, 73, 75  
   gallstones and, 308, 311-13,  
   318  
   hyperhomocyst(e)inemia and,  
   285

- placental nutrient transport  
and, 192
- Monoacylglycerols  
human milk and, 434
- Monoalkylglycerols  
human milk and, 422
- Monoamine oxidase  
tryptophan and, 238
- Monobutyrin  
adipose tissue and, 210, 226
- Monocarboxylates  
placental nutrient transport  
and, 189-90
- Monoglyceride lipase  
adipose tissue and, 210
- 2-Monopalmitoylglycerol  
human milk and, 434
- Monosaccharides  
fat substitutes and, 483  
placental nutrient transport  
and, 185-86
- Mono unsaturated fatty acids  
human milk and, 426  
infant formulas and, 433
- Mortality  
cancer and, 394-408  
cobalamin deficiency and, 60,  
62  
hyperhomocyst(e)inemia and,  
295
- Motion sickness  
space  
microgravity and, 260, 267
- Motretinide  
cancer, 166
- Mouth cancer  
cholesterol and, 405
- Mucilages  
dietary fiber and, 22
- Mucin  
gallstones and, 303-5, 311,  
312, 318
- Mucopolysaccharides  
dietary fiber and, 27
- Muscle  
cobalamin neuropathy and,  
67  
collagen and, 372  
eosinophilia-myalgia syn-  
drome and, 247  
space flight and, 260  
toxic oil syndrome and, 248
- Mutagenicity  
food processing and, 124
- Myelin sheath  
cobalamin neuropathy and,  
60, 62, 64-66, 68, 70-  
73, 75-76  
eosinophilia-myalgia syn-  
drome and, 245
- Myelodysplastic syndromes  
retinoids and, 162, 168,  
173
- Myocardial infarction  
hyperhomocyst(e)inemia and,  
288, 290-91
- N
- Na<sup>+</sup>  
placental nutrient transport  
and, 186-92, 195-99  
space flight and, 268, 270-71
- NAD(P)  
cellular energy metabolism  
and, 332-36, 338-41
- $\alpha$ -Naphthyl acetate hydrolase  
adipose tissue and, 210
- Nausea  
space motion sickness and,  
267  
toxic oil syndrome and, 247
- Neck cancer  
retinoids and, 162, 167
- Neurocognitive symptoms  
eosinophilia-myalgia syn-  
drome and, 246
- Neuroleptism  
in India, 11-12
- Neuromuscular coordination  
space flight and, 263
- Neuropathy  
cobalamin deficiency and, 60-  
76  
eosinophilia-myalgia syn-  
drome and, 245, 247,  
250  
toxic oil syndrome and, 248
- Neurotoxin  
eosinophilia-myalgia syn-  
drome and, 245-46, 250
- Neutrophils  
retinoic acid and, 164
- New Zealand  
cancer risk and, 397
- Niacin  
cancer risk and, 403  
pellagra and, 11  
tryptophan and, 237-38
- Nicotinamide  
pellagra and, 11  
tryptophan and, 238
- Nicotinamide adenine di-  
nucleotide (NAD)  
cellular energy metabolism  
and, 332-35, 337-41  
pellagra and, 11  
tryptophan and, 237-38
- Nicotinic acid  
cancer risk and, 403  
pellagra and, 10-11  
placental nutrient transport  
and, 191  
tryptophan and, 237-38
- Nitrate reductase  
dietary fiber and, 29
- Nitric oxide  
urea cycle and, 82, 95
- N*-[4-(5-Nitro-2-furyl)-2-  
thiazolyl]formamide  
(FANFT)  
retinoids and, 163, 171, 174
- Nitrogen  
food processing and, 124  
placental nutrient transport  
and, 188  
space flight and, 263, 268-69  
urea cycle and, 85
- Nitroreductase  
dietary fiber and, 29
- Nitrosamines  
cancer and, 163, 169-71  
food processing and, 125  
structure of, 163  
vitamin C and, 144, 147  
vitamin E and, 144
- Nitroso compounds  
food processing and, 131  
vitamin C and, 142
- Nitrosourea  
cancer and, 163
- Nitrous oxide (N<sub>2</sub>O)  
cobalamin neuropathy and,  
60-62, 66-71, 75
- Nonsteroidal antiinflammatory  
drugs (NSAIDs)  
eosinophilia-myalgia syn-  
drome and, 247
- North America  
cancer risk and, 394, 396  
eosinophilia-myalgia syn-  
drome and, 236  
human milk composition and,  
427
- N system  
placental nutrient transport  
and, 187
- Nuclear magnetic resonance  
(NMR)  
mitochondrial respiration in  
heart and, 331
- Nucleic acids  
oxidative damage and, 140,  
142
- Nucleophiles  
food processing and, 131
- Nucleosides  
placental nutrient transport  
and, 193
- 5'-Nucleotidase  
placental nutrient transport  
and, 184
- Numbness  
cobalamin neuropathy and, 60
- Nutritional stress  
adaptation to, 4-6
- Nuts  
antioxidant properties and,  
146

## O

## Oats

dietary fiber and, 20

## Obesity

adipose tissue and, 225  
cellular energy metabolism  
and, 340  
gallstones and, 307-9  
lactational capacity and, 105-  
8, 114

## ob gene

adipose tissue and, 225

## Occlusive microangiopathy

eosinophilia-myalgia syn-  
drome and, 245

## Occlusive vascular disease

hyperhomocyst(e)inemia and,  
279-95

## Octreotide

eosinophilia-myalgia syn-  
drome and, 247

## Odd-chain fatty acids

cobalamin neuropathy and,  
63-66

## Oils, dietary

antioxidant properties and,  
145-46  
"empty calories" and, 3  
endemic goiter and, 10  
gallstones and, 308, 310-11,  
313-14  
infant formulas and, 432  
lactational capacity and, 107,  
112

## Oleic acid

infant formulas and, 433

## Oligosaccharides

dietary fiber and, 28

## Olive oil

cholesterol and, 402

## Oral cancers

cholesterol and, 405  
retinoids and, 167, 174  
vitamin E and, 144

## Oranges

antioxidant properties and,  
132, 146

## Ornithine aminotransferase

promoter  
urea cycle element and,  
92

## L-Ornithine carbamoyltransferase

urea cycle and, 81

## Ornithine transcarbamylase

urea cycle and, 81, 83, 85-  
88, 91-92, 94

## Orthophosphoric acid

iron fortification and, 9

## Osmoregulation

urea cycle and, 81

## Osteomalasia

vitamin D and, 380

## Osteopontin

vitamin A and, 378

## Osteoporosis

collagen and, 375  
fluorosis and, 13

## Ovarian cancer

carotenes and, 148  
vitamin C and, 150

## Overnutrition

maternal  
lactational capacity and  
103-14

## Oxalates

dietary fiber and, 25

## Oxidative damage

protection against, 139-55

## Oxidative phosphorylation

cellular energy metabolism  
and, 332-33, 335-40

 $\alpha$ -Oxoglutarate

placental nutrient transport  
and, 190

## 2-Oxoglutarate

cellular energy metabolism  
and, 339

## 2-Oxoglutarate dehydrogenase

cellular energy metabolism  
and, 334

## 4-Oxoretinoic acids

cancer and, 165

## 4-Oxo retinol

retinol activation and, 50

## Oxygen

cellular energy metabolism  
and, 331-37  
hyperhomocyst(e)inemia and,  
293

placental nutrient transport  
and, 185, 189

## radicals

antioxidants and, 140  
food processing and, 127,  
131, 133

## P

p21<sup>ras</sup> gene

cholesterol and, 410

## P450 aromatase

adipose tissue and, 224-25

## Paddy-husk carbon

fluorosis and, 13

## Palmitic acid

gallstones and, 312

## Palm olein

infant formulas and, 433

Pancreas  $\alpha$ -amylases and, 22

cancer of  
carotenes and, 149  
cholesterol and, 405  
retinoids and, 17-71, 173-  
74

vitamin C and, 147, 150

vitamin E and, 151

food processing and, 127  
human milk and, 433-34  
protein-calorie malnutrition  
and, 4

protein turnover and, 4

## Pantothenic acid

placental nutrient transport  
and, 191

## Papillomas

retinoids and, 164-66, 171-  
72, 174

## Paracetamol

viscous polysaccharides and,  
25

## Paraffins

fat substitutes and, 484

## Paralysis

## spastic

cobalamin neuropathy and,  
61-62

## Paraplegia

## spastic

lathyrism and, 11

## Parathyroid hormone (PTH)

collagen metabolism and,  
382-83

placental nutrient transport  
and, 195

space flight and, 264

## Parachute layers

## leaf

dietary fiber and, 20

## Parenchymatous tissues

dietary fiber and, 20

## Parenteral nutrition

food processing and, 132

## Paresthesia

eosinophilia-myalgia syn-  
drome and, 244-46

## Peanut butter

antioxidant properties and,  
146

lactational capacity and  
106

## Peas

antioxidant properties and,  
146

## Pectins

dietary fiber and, 20-22, 25,  
28, 30-31  
gallstones and, 316-17

## Pellagra

in India, 10-11

## D-Penicillamine

eosinophilia-myalgia syn-  
drome and, 247

## Pentose phosphate

pathway  
cellular energy metabolism  
and, 338

## Perilipin

adipose tissue and, 213

- Peripheral edema  
cobalamin deficiency and, 60-76  
eosinophilia-myalgia syndrome and, 244, 246  
toxic oil syndrome and, 248
- Peritoneum  
adipose tissue and, 212
- Perivascularitis  
eosinophilia-myalgia syndrome and, 245
- Pernicious anemia  
cobalamin neuropathy and, 65
- Pesticides  
dietary fiber and, 27
- pH  
food processing and, 120-23, 132  
placental nutrient transport and, 188-89, 195-96  
urea cycle and, 82, 95
- Phenolic acid  
dietary fiber and, 25
- Phenolic esters  
dietary fiber and, 20
- Phenylalanine  
food processing and, 121  
placental nutrient transport and, 186-87
- Phenylephrine  
adipose tissue and, 215
- Phosphate  
cellular energy metabolism and, 331-32, 334-38, 340-41  
placental nutrient transport and, 195-96  
space flight and, 270
- Phosphatidylcholine  
cobalamin neuropathy and, 66  
human milk and, 423  
infant formulas and, 432
- Phosphatidylethanolamine  
cobalamin neuropathy and, 66  
human milk and, 423
- Phosphatidylinositol  
human milk and, 423
- Phosphatidylserine  
human milk and, 423
- Phosphodiesterase  
adipose tissue and, 213, 220
- Phosphoenolpyruvate carboxykinase  
adipose tissue and, 213  
gene for, 92
- Phospholipase A2  
adipose tissue and, 218
- Phospholipase C  
parathyroid hormone and, 382
- Phospholipids  
gallstones and, 306, 309, 311, 313  
human milk and, 420, 422-24, 428, 431, 436  
infant formulas and, 432
- Phosphorus  
space flight and, 264, 271  
vitamin D and, 380
- Phylloquinone  
human milk and, 431
- Phytates  
dietary fiber and, 25  
iron availability and, 8
- Picolonic acid  
tryptophan and, 238
- Piconilate carboxylase  
pellagra and, 11
- Pigs  
cobalamin neuropathy and, 61-63, 68, 71, 73, 75  
gallstones and, 317  
hyperhomocyst(e)inemia and, 285  
white adipose tissue and, 209-10
- Pineal gland  
inter-photoreceptor retinoid-binding protein and, 46
- Pineapple juice  
food processing and, 132
- Pituitary hormones  
adipose tissue and, 212
- Placenta  
brush border membrane and, 49  
iron-responsive element binding proteins and, 351-52, 363  
nutrient transport pathways across epithelium of, 184-85, 199-200  
inorganic nutrients, 193-99  
organic nutrients, 185-93  
retinol-binding protein and, 47
- Plants  
dietary fiber and, 20-24  
methionine and, 130
- Plasma  
retinoids and, 43-46  
space flight and, 268
- Plasma membrane  
placental nutrient transport and, 194
- Plasmapheresis  
eosinophilia-myalgia syndrome and, 247
- Plasmin  
collagen and, 374
- Platelet-derived growth factor (PDGF)  
adipose tissue and, 222
- Platelets  
hyperhomocyst(e)inemia and, 285, 292-94
- Pneumonitis  
eosinophilia-myalgia syndrome and, 245
- Pods  
dietary fiber and, 20
- Polyamines  
cobalamin neuropathy and, 74-76  
urea cycle and, 82-83
- Polycyclic hydrocarbons  
retinoids and, 162-63
- Polydextrose  
fat substitutes and, 482-83
- Polyenes  
gallstones and, 311-12
- Polyphosphoinositides  
adipose tissue and, 220
- Polyposis  
rectal  
antioxidants and, 153-54  
cholesterol and, 404
- Polsaccharides  
dietary fiber and, 19-23, 25, 27  
gallstones and, 316
- Polysomes  
ferritin mRNA and, 353-54
- Polynunsaturated fatty acids (PUFAs)  
gallstones and, 308-12, 315, 318-19  
human milk and, 423-24, 426-27, 431, 435-37  
infant formulas and, 432-33, 436  
oxidative damage and, 142
- Posttranscriptional regulation  
iron-responsive element binding proteins and, 353-57
- Potatoes  
antioxidant properties and, 146  
dietary fiber and, 22  
fat substitutes and, 481  
food processing and, 132
- Prairie dogs  
gallstones and, 302, 307, 311-12, 317-19
- Prednisone  
eosinophilia-myalgia syndrome and, 247
- Pregnancy  
breast enlargement and, 105  
collagen and, 375  
endemic goiter and, 10  
food restriction and, 111  
hyperhomocyst(e)inemia and, 283  
obesity and, 106, 108
- Probuco  
cholesterol and, 402
- Pregesterone  
adipose tissue and, 221

- retinoids and, 169
- Prolactin  
response  
to suckling, 105
- Proline  
collagen and, 370, 373  
placental nutrient transport  
and, 186
- Prolyl hydroxylase  
ascorbic acid and, 379-80
- Propionate  
cobalamin neuropathy and,  
64-65  
dietary fiber and, 29
- Propionic acid  
cobalamin neuropathy and,  
62-64, 66-67  
dietary fiber and, 25-26, 28
- Propionyl CoA  
cobalamin neuropathy and,  
63-65
- Prostacyclin (PGI<sub>2</sub>)  
adipose tissue and, 221  
hyperhomocyst(e)inemia and,  
292-94
- Prostaglandin E<sub>2</sub> (PGE<sub>2</sub>)  
adipose tissue and, 210
- Prostaglandins  
adipose tissue and, 220-21,  
226  
bile lipids and, 303  
cellular energy metabolism  
and, 337  
gallstones and, 311-12  
human milk and, 428
- Prostate cancer  
carotenes and, 148  
cholesterol and, 394  
vitamin E and, 152
- Protease  
inhibitors  
food processing and, 126-  
27
- Protein  
dietary fiber and, 25-27, 84-  
87  
food processing and, 124-27,  
129, 132  
gallstones and, 305, 307,  
313-14  
human milk and, 419-21,  
423, 428  
lactational capacity and, 107-  
9, 112  
protein-energy malnutrition  
and, 2-3  
reactive oxygen species and,  
140  
space flight and, 263, 267-69,  
271  
urea cycle and, 82-83, 86
- Protein-energy malnutrition  
in India, 2-6
- Protein-free diets  
urea cycle and, 84
- Protein kinases  
placental nutrient transport  
and, 184, 189  
urea cycle and, 93
- Protein phosphorylation  
adipose tissue and, 221
- Proteoglycans  
collagen metabolism and, 375  
vitamin C and, 378  
vitamin D and, 381
- Prothrombin  
hyperhomocyst(e)inemia and,  
294
- Protoporphyrin IX  
ferritin and, 357
- Provitamin A  
antioxidant activity and, 142
- Provitamins  
antioxidant chemical proper-  
ties and, 140
- Pruritis  
eosinophilia-myalgia syn-  
drome and, 246  
toxic oil syndrome and, 248
- Psyllium  
gallstones and, 316-17
- Pteroylglutamic acid  
cobalamin neuropathy and,  
68-69
- Puerto Rico  
cancer risk and, 394
- Pulse  
lathyrism and, 11-12
- Pyridoxal 5'-phosphate  
hyperhomocyst(e)inemia and,  
282
- Pyridoxine  
see Vitamin B<sub>6</sub>
- Pyruvate  
cobalamin neuropathy and, 64  
placental nutrient transport  
and, 189-90
- Pyruvate dehydrogenase  
cellular energy metabolism  
and, 334, 339
- Q**
- Quinolate phosphoribosyl  
transferase (QPRT)  
pellagra and, 11
- Quinolinic acid  
pellagra and, 11  
tryptophan and, 238, 246
- R**
- Rabbits  
cancer and, 172  
hyperhomocyst(e)inemia and,  
284
- iron-responsive element bind-  
ing proteins and, 351,  
356  
iron-responsive elements and,  
350  
white adipose tissue and, 209
- Racemization  
of amino acids, 120-22
- Rana castesbian*  
ferritin and, 348, 350-51, 355
- Rapeseed oil  
toxic oil syndrome and, 248
- Rash  
eosinophilia-myalgia syn-  
drome and, 244, 246  
toxic oil syndrome and, 248
- Rats  
adipose tissue and, 211-12,  
214-17, 222, 225  
carotenoids and, 143  
collagen metabolism and,  
375-77  
eosinophilia-myalgia syn-  
drome and, 248-49  
food processing and, 122-23,  
129  
gallstones and, 311, 317  
hyperhomocyst(e)inemia and,  
283, 285  
iron-responsive element bind-  
ing proteins and, 351,  
353-54, 363  
iron-responsive elements and,  
349-50  
lactational capacity and, 106-  
11  
placental nutrient transport  
and, 192, 199  
retinoids and, 168-74  
space flight and, 268  
vitamin D and, 381  
white adipose tissue and,  
208
- Raynaud's phenomenon  
eosinophilia-myalgia syn-  
drome and, 245
- Recommended daily allowance  
(RDA)  
cereal protein, 127  
vitamin A, 429  
vitamin D, 429-30  
vitamin E, 431  
vitamin K, 431
- Rectal cancer  
β-carotene and, 149, 152  
cholesterol and, 404  
vitamin C and, 150, 153-54  
vitamin E and, 152, 153-54
- Reducing agents  
food processing and, 131
- Respiratory control  
coordinated multisite regula-  
tion and, 338-41

- Response elements
  - retinoic acid and, 38-39, 42, 448-50
- Restlessness
  - vitamin A toxicity and, 6
- Retinal
  - cancer and, 165
  - inter-photoreceptor retinoid-binding protein and, 46
  - reduction of, 39
  - structure of, 162
- Retinal pigment epithelial cells
  - lecithin:retinol acyltransferase in, 50
  - retinol and, 47-48
- Retinamides
  - cancer and, 164, 170-71, 173
- Retinoic acid
  - adipose tissue and, 222
  - cancer and, 164, 166-75
  - collagen metabolism and, 377-78
  - epididymal-binding proteins and, 47
  - receptors, 449, 460-63
    - developmental expression, 455-56
    - DNA-binding domain, 445-48
    - hinge region: region D, 454-55
    - ligand-binding domain, 450-54
    - nuclear receptor structure and function, 445
    - phosphorylation, 455
    - regulation of function, 456-57
    - responsive elements, 38-39, 42, 448-50
    - retinol and, 50-51
    - structure of, 162
    - synthesis of, 51
- Retinoids
  - adipose tissue and, 222
  - cancer prevention and, 161-75
  - CRBP(II) transcription and, 39
  - development and, 444-45
  - function of, 38
  - human milk and, 429-30
  - major pathways for transport of, 40
  - metabolism of, 461
  - receptors for, 164
  - signal transduction and, 461-63
  - toxicity of, 174-75
- Retinoid X receptors
  - function of, 457-60, 462-63
- Retinol
  - see Vitamin A
- Retinol-binding protein
  - blood-brain barrier and, 48-49
  - blood-testis barrier and, 48-49
  - chylomicron remnant retinyl esters and, 41
  - keratinocytes and, 49
  - in paracrine transfer of retinol to liver stellate cells, 41-42
  - placental brush border membranes and, 49
  - placental nutrient transport and, 192
  - plasma retinol homeostasis and, 44-46
  - retinal pigment epithelial cells and, 47-48
  - retinol mobilization from stellate cells and, 43
  - in turnover and recycling of plasma retinol, 43-44
- Retinoyl glucuronides
  - retinol activation and, 50, 52
- Retinyl acetate
  - cancer and, 165, 168-75
  - keratomalacia and, 7
- Retinyl ester hydrolase
  - chylomicron remnant retinyl esters and, 41
  - plasma retinol homeostasis and, 45
- Retinyl esters
  - cancer and, 167
  - chylomicron remnant, 40-41
  - human milk and, 434
  - intestinal absorption of, 39
  - placental nutrient transport and, 192
  - preformed, 38
  - storage of in stellate cells, 42
- Retinyl methyl ether
  - cancer and, 165, 168
  - structure of, 162
- Retinyl palmitate
  - cancer and, 165-75
- Retinyl propynyl ether
  - cancer and, 168
- Rhamnose
  - dietary fiber and, 21
- Rheumatoid factor
  - eosinophilia-myalgia syndrome and, 244
- Riboflavin
  - esophageal cancer and, 173
  - in nutrition, 14
  - placental nutrient transport and, 191
  - space flight and, 270-71
- Ribonucleoprotein particles (RNPs)
  - ferritin mRNA and, 346, 353-54
- Rice flour
  - gallstones and, 315
- Rickets
  - vitamin D and, 380
- RNA-binding proteins
  - iron homeostasis and, 346-64
  - translational regulation and, 350-51, 353-57, 359, 363
- Roussetus aegyptiacus
  - cobalamin neuropathy and, 60-62, 66-73, 75
- Rous sarcoma virus
  - etretinate and, 172
- RPMI 2650 cells
  - urea cycle and, 90
- Runner beans
  - dietary fiber and, 20
- S
  - S-100 proteins
    - adipose tissue and, 210
  - Saccharomyces cerevisiae*
    - amino acid biosynthesis in, 90
  - Safety requirements
    - for foods, 476-81
  - Saliva
    - $\alpha$ -amylases and, 22
  - Salivary gland tumors
    - $\beta$ -carotene and, 143
    - retinoids and, 173
  - Salt
    - common
      - iodation and, 9-10
      - iron fortification and, 8-9
  - Sarcomas
    - retinoids and, 172
  - Saturated fats
    - cancer risk and, 407
    - gallstones and, 311
  - Saturated fatty acids
    - human milk and, 425
    - infant formulas and, 433
  - Scavengers
    - reactive oxygen species and, 140
  - Schiff's bases
    - food processing and, 126
  - Scleroderma-like syndrome
    - eosinophilia-myalgia syndrome and, 245-46, 251
    - toxic oil syndrome and, 248
  - Scurvy
    - vitamin C and, 378
  - Selenate
    - placental nutrient transport and, 199

- Selenium  
 free radical scavengers and, 140  
 vitamin C and, 144  
 vitamin E and, 142
- SENCAR mice  
 retinoids and, 166
- Serine  
 cobalamin neuropathy and, 74  
 food processing and, 121-22  
 placental nutrient transport and, 186-87
- Serine proteases  
 collagen and, 374
- Serotonin  
 placental nutrient transport and, 196, 198  
 tryptophan and, 237-38, 251
- Sertoli cells  
 retinol-binding protein receptors and, 48-49
- Set points  
 metabolic, 338-40
- Sex hormone-binding globulins  
 cancer risk and, 401
- Shope papilloma virus  
 etretinate and, 172
- Short chain fatty acids (SCFAs)  
 dietary fiber and, 25, 27-29, 31
- Shrimp  
 antioxidant properties and, 146
- Signaling molecules  
 urea cycle and, 82
- Signal transduction  
 retinoids and, 461-63
- Silicates  
 dietary fiber and, 25
- Sitosterol  
 human milk and, 424
- Skatole  
 tryptophan and, 238
- Skeletal muscle  
 chylomicron remnant retinyl esters and, 40  
 space flight and, 263, 266, 275  
 toxic oil syndrome and, 248
- Skin  
 acyl CoA:retinol acyltransferase and, 50  
 cancer  
 $\beta$ -carotene and, 149, 153-54  
 cholesterol and, 394  
 retinoids and, 162, 164-66, 174  
 vitamin C and, 154  
 vitamin E and, 144, 151-52, 154  
 collagen and, 372, 374-75  
 eosinophilia-myalgia syndrome and, 246  
 toxic oil syndrome and, 248
- Small intestine  
 human milk and, 433-34  
 urea cycle and, 82, 87-88
- Sodium acid sulphate  
 iron fortification and, 9
- Sodium ascorbate  
 food processing and, 124-25
- Sodium bisulfite  
 food processing and, 132
- Sodium chloride  
 space flight and, 264
- Sodium citrate  
 food processing and, 125
- Sodium gluconate  
 food processing and, 125
- Sodium glutamate  
 food processing and, 125
- Sodium hydroxide-methanol  
 human milk and, 425
- Sodium sulfite  
 food processing and, 127, 132
- Sol  
 dietary fiber and, 30
- Somatomedin  
 kwashiorkor and, 4  
 marasmus and, 4  
 protein-calorie malnutrition and, 4
- Somatostatin  
 analogue  
 eosinophilia-myalgia syndrome and, 247
- Sorghum  
 fluorosis and, 13  
 pellagra and, 10-11
- Soviet Union  
 breast cancer and, 147
- Soybean trypsin inhibitor  
 food processing and, 125-26
- Soy oil  
 infant formulas and, 433
- Soy products  
 food processing and, 124-25, 127, 129, 132  
 infant formula and, 126
- Sp1 binding sites  
 urea cycle and, 91-92
- Space flight  
 nutritional requirements during, 257-59, 272  
 energy requirements, 266-68  
 fluid, electrolyte, and mineral requirements, 269-70  
 microgravity effects, 259-66  
 nutrient delivery systems, 271-76  
 protein requirements, 268-69  
 vitamin requirements, 270-71
- Space of Disse  
 chylomicron remnant retinyl esters and, 41
- Spain  
 toxic oil syndrome and, 247
- Spasticity  
 cobalamin neuropathy and, 72
- Sperm  
 retinoic acid and, 47
- Sphingomyelin  
 cobalamin neuropathy and, 66  
 human milk and, 423  
 infant formulas and, 432
- Spinach  
 antioxidant properties and, 146
- Spinal cord lesions  
 cobalamin neuropathy and, 60, 62-63, 65-66, 68, 70-71
- Spleen  
 chylomicron remnant retinyl esters and, 41  
 hyperhomocyst(e)inemia and, 283  
 toxic oil syndrome and, 247
- Squalene  
 cholesterol and, 410  
 human milk and, 424
- Squamous cell carcinomas  
 retinoids and, 166, 171, 174
- Squash  
 antioxidant properties and, 146
- Starch, dietary  
 dietary fiber and, 20, 22-23, 26-28  
 fat substitutes and, 481  
 food processing and, 124
- Starvation  
 cellular energy metabolism and, 340  
 collagen metabolism and, 374-76  
 urea cycle and, 84
- Stellate cells  
 liver  
 retinoids and, 41-43, 48
- Steroids  
 adipose tissue and, 214, 221, 224  
 collagen synthesis and, 372  
 placental nutrient transport and, 190
- Sterols  
 dietary fiber and, 25-26  
 gallstones and, 305, 309, 311, 313, 317  
 human milk and, 422-24



- infant formulas and, 432
- space motion sickness and, 267
- Stomach**
  - cancer**
    - carotenes and, 149
    - cholesterol and, 395, 404
    - retinoids and, 162, 174
    - vitamin C and, 147, 149-50
    - vitamin E and, 151-52
  - human milk and, 433
  - nitrosamines and, 144
  - N-nitroso compounds and, 142
- Stool**
  - dietary fiber and, 29-31
- Strawberries**
  - antioxidant properties and, 146
  - dietary fiber and, 20
- String beans**
  - antioxidant properties and, 146
- Strokes**
  - hyperhomocyst(e)inemia and, 280
- Stromelysin**
  - collagen and, 374
- Suberin**
  - dietary fiber and, 20
- Succinate**
  - cellular energy metabolism and, 339, 341
  - placental nutrient transport and, 190
- Succinate dehydrogenase**
  - cellular energy metabolism and, 339
- Succinyl CoA**
  - 5'-aminolevulinate synthase and, 356
  - cobalamin neuropathy and, 61-62, 64
- Sucrose**
  - gallstones and, 314, 316
- Sucrose polyester**
  - fat substitutes and, 483-84
- Sulfate**
  - placental nutrient transport and, 199
- Sulfhydryl protein**
  - gallstones and, 314
- Sulfites**
  - food processing and, 127, 132
- Sulfur**
  - food processing and, 132
  - gallstones and, 313-14
  - hyperhomocyst(e)inemia and, 293
- Sulphate**
  - dietary fiber and, 27-28
- Superoxide**
  - hyperhomocyst(e)inemia and, 293
- Superoxide dismutase (SOD)**
  - hyperhomocyst(e)inemia and, 292
- Sweet potatoes**
  - antioxidant properties and, 146
- Syncytiotrophoblast**
  - placental nutrient transport and, 184-86, 189, 191, 193, 195, 197-200
- T**
  - Tallow**
    - infant formulas and, 432
  - Tapioca**
    - fat substitutes and, 481
  - Taurine**
    - bile acids and, 301
    - gallstones and, 302, 304, 313-14, 316-17
    - placental nutrient transport and, 189, 198
    - retinol catabolism and, 52
  - Taurocholate**
    - bile acids and, 301
    - gallstones and, 312-13
    - placental nutrient transport and, 190
  - Tear fluid**
    - retinol-binding protein and, 47
  - Temarotene**
    - cancer and, 168
  - Tendons**
    - collagen and, 372, 374
  - Teratogenicity**
    - retinoids and, 174-75
  - Terminal differentiation**
    - adipose tissue and, 218-23, 226
  - Testes**
    - retinol and, 48-49
  - Testosterone**
    - adipose tissue and, 214, 221
    - cancer risk and, 401
  - 12-O-Tetradecanoylphorbol-13-acetate (TPA)**
    - retinoids and, 165-66, 174
  - Tetrahydrofolate**
    - cobalamin neuropathy and, 62, 69
  - Thiamin**
    - placental nutrient transport and, 191
  - Thiolactone**
    - hyperhomocyst(e)inemia and, 284-85, 292
  - Thiols**
    - food processing and, 127
  - hyperhomocyst(e)inemia and, 293-94
  - Threonine**
    - food processing and, 127, 129
  - Threonine dehydratase**
    - food processing and, 129
  - Thromboembolism**
    - hyperhomocyst(e)inemia and, 280, 284, 289, 292-94
  - Thromboxanes**
    - hyperhomocyst(e)inemia and, 293-94
  - Thymic cancer**
    - retinoids and, 173
  - Thymidine**
    - cobalamin neuropathy and, 74
  - Thyroid hormone**
    - urea cycle and, 86
  - Thyroid-stimulating hormone (TSH)**
    - endemic goiter and, 10
    - eosinophilia-myalgia syndrome and, 244
  - Thyroxine (T<sub>4</sub>)**
    - endemic goiter and, 10
    - urea cycle and, 86-87
  - Tissue inhibitor of metalloproteinase**
    - vitamin D and, 381
  - Tissue-specific extinguisher-1 (TSE1)**
    - urea cycle and, 93
  - Toads**
    - iron-responsive elements and, 349-50
  - Tobacco**
    - cancer and, 147
  - Tocopherols**
    - see Vitamin E
  - toll gene**
    - iron-responsive element binding proteins and, 355
    - iron-responsive elements and, 349
  - Tomatoes**
    - antioxidant properties and, 146
  - Toxic compounds**
    - food processing and, 123-25, 132
    - urea cycle and, 81
  - Toxic oil syndrome**
    - eosinophilia-myalgia syndrome and, 246-48, 251
  - Trace elements**
    - fluorosis and, 13
    - human milk and, 428
    - placental nutrient transport and, 199
  - Trace metals**
    - hyperhomocyst(e)inemia and, 293

- Trace minerals  
  antioxidant chemical properties of, 140
- Tragacanthin  
  dietary fiber and, 22
- Transaminases  
  tryptophan and, 238
- Transcobalamin II  
  hyperhomocyst(e)inemia and, 283
- Transcriptional control  
  urea cycle enzymes and, 90-94
- trans* fatty acids  
  human milk and, 436  
  infant formulas and, 433
- Transferrin  
  placental nutrient transport and, 198  
  receptor  
    iron-responsive element  
      binding proteins and, 346-49, 355, 357-59, 361-64
- Transfer RNA (tRNA)  
  1,1'-ethylidenebis[tryptophan] and, 251
- Transforming growth factor  $\beta$  (TGF- $\beta$ )  
  adipose tissue and, 210, 222  
  collagen metabolism and, 380
- Transforming growth factor  $\beta_1$  (TGF- $\beta_1$ )  
  eosinophilia-myalgia syndrome and, 244
- Transgenic mice  
  urea cycle and, 94
- Translational regulation  
  iron-responsive element binding proteins and, 346-47, 352-57, 361-62, 364
- Transthyretin  
  retinoids and, 40, 44-46  
  vitamin A and, 48
- Triacylglycerols  
  adipose tissue and, 210-13, 217, 220-22  
  chylomicrons and, 40  
  human milk and, 419-20, 422-24, 428, 431, 433-35  
  infant formulas and, 432  
  placental nutrient transport and, 190
- Tricarboxylic acid cycle  
  placental nutrient transport and, 190
- Triene-tetrane  
  human milk and, 436
- Triglycerides  
  cancer risk and, 401  
  fat substitutes and, 483-84  
  fatty acids and, 65  
  gallstones and, 309-11, 314-16  
  human milk and, 435  
  placental nutrient transport and, 190
- Triiodothyronine ( $T_3$ )  
  adipose tissue and, 212, 219, 223
- Trisaccharides  
  dietary fiber and, 28
- Trophoblast  
  placental nutrient transport and, 184-86, 188-95, 197-200
- Trypsin  
  inhibitor  
    food processing and, 126-27
- Tryptamine  
  tryptophan and, 238
- Tryptophan  
  biochemistry and metabolism of, 237-38  
  eosinophilia-myalgia syndrome and, 236, 238-46, 249-52  
  food processing and, 124-25, 131  
  pellagra and, 10-11  
  placental nutrient transport and, 186  
  therapeutic use of, 236-37
- T system  
  placental nutrient transport and, 186
- Tumor necrosis factor  $\alpha$  (TGF- $\alpha$ )  
  adipose tissue and, 222
- Tuna  
  antioxidant properties and, 146
- Twins  
  monozygotic  
    hyperhomocyst(e)inemia and, 287
- Tyrosine  
  food processing and, 121  
  placental nutrient transport and, 186
- U
- Ultraviolet (UV) light  
  carotenoids and, 143  
  eosinophilia-myalgia syndrome and, 251  
  retinoids and, 166, 174
- Uncoupling protein  
  brown adipose tissue and, 214-15, 223-26
- Undernutrition  
  maternal  
    lactational capacity and, 103-5, 109-14
- United States  
  cancer risk and, 394-97  
  eosinophilia-myalgia syndrome and, 235-47  
  human milk composition and, 426-27, 429
- Urea cycle  
  element, 92  
  enzymes and, 81-87, 90-95  
  food processing and, 132
- Uric acid  
  antioxidant activity of, 140
- Urine  
  space flight and, 267, 270
- Uronic acid  
  dietary fiber and, 23, 25
- Uterus  
  retinol-binding protein and, 47
- V
- Valerate  
  dietary fiber and, 28
- Valine  
  cobalamin neuropathy and, 64, 66-67
- Vascular bundles  
  leaf  
    dietary fiber and, 20
- Vasculitis  
  eosinophilia-myalgia syndrome and, 245, 250
- Vegetable oil  
  gallstones and, 310, 314
- Vegetable protein  
  gallstones and, 310, 314, 319  
  urea cycle and, 84
- Vegetable shortening  
  lactational capacity and 106
- Vegetables  
  antioxidant properties and, 146  
  cancer risk and, 141-42, 147-48, 153-55  
  dietary fiber and, 20, 22-23  
  space flight and, 270
- Vegetarian diet  
  gallstones and, 310, 313  
  human milk composition and, 429  
  space flight and, 272
- Very-low density lipoprotein (VDL)  
  cancer risk and, 406  
  gallstones and, 302, 304, 307-9, 313, 316, 318  
  human milk and, 421

- placental nutrient transport and, 190
- Vibrio cholerae* enterotoxin from in human milk, 435
- Vinegar antioxidant properties and, 146
- Viscera protein-calorie malnutrition and, 4
- Vitamin A adipose tissue and, 221 cancer and, 164-65, 173, 408 carotenoids and, 39, 142-43 cellular uptake of, 48 blood-brain barrier, 48-49 blood-testis barrier, 48-49 hepatocytes, 48 keratinocytes, 49 liver stellate cells, 48 placental brush border membranes, 49 retinal pigment epithelial cells, 47-48 chylomicron remnant retinyl esters and, 40-41 collagen metabolism and, 377-78 deficiency of, 6, 8, 41 dietary sources of, 38 gene expression and, 443-63 human milk and, 428-30, 437 intercellular transport of, 46-47 inter-photoreceptor retinoid-binding protein and, 46 intestinal absorption of, 38-40 intracellular metabolism of, 49 activation, 50-51 catabolism, 51-52 esterification, 39-40, 50 liver handling of, 41-43 metabolism of, 14 mobilization of from stellate cells, 42-43 paracrine transfer of to liver stellate cells, 41-42 placental nutrient transport and, 192 plasma homeostasis, 44-46 turnover and recycling of, 43-44 RDA for, 429 space flight and, 270-71 structure of, 162 tissue uptake of, 40-41 toxicity of, 6-7
- Vitamin B<sub>3</sub> see Niacin
- Vitamin B<sub>6</sub> adipose tissue and, 221 hyperhomocyst(e)inemia and, 282, 285, 293-94 pellagra and, 11 placental nutrient transport and, 191
- Vitamin B<sub>12</sub> see Cobalamin
- Vitamin C adipose tissue and, 221 antioxidant properties of, 140-44, 149-54 collagen metabolism and, 374, 378-80 major dietary sources of, 145-47 placental nutrient transport and, 190-92 space flight and, 275
- Vitamin D adipose tissue and, 221 collagen metabolism and, 380-81 human milk and, 428-30, 437 placental nutrient transport and, 192 RDA for, 429-30 space flight and, 264, 270-71
- Vitamin E adipose tissue and, 221 antioxidant properties of, 140-44, 151-54 cancer risk and, 407 human milk and, 420, 428, 430-31, 437 inter-photoreceptor retinoid-binding protein and, 46 major dietary sources of, 145-47 placental nutrient transport and, 193 RDA for, 431 space flight and, 271 sucrose polyester and, 483
- Vitamin K adipose tissue and, 221 fat substitutes and, 480 human milk and, 428, 431-32, 437 placental nutrient transport and, 193 RDA for, 431
- Vitamins adipose tissue and, 221 antioxidant chemical properties of, 140 cancer risk and, 407-8 dietary fiber and, 25 fat-soluble, 190, 407-8, 428-32, 437, 483-84 fat substitutes and, 483-84 food processing and, 133 human milk and, 428-32, 437 lipid-soluble, 192-93 placental nutrient transport and, 190-93 water-soluble, 190-91
- Vomiting space motion sickness and, 267
- Vulva cancer of carotenes and, 149 vitamin C and, 150
- W
- Water antioxidant solubility and, 142 cobalamin neuropathy and, 62 colon and, 30-31, 33 space flight and, 264
- Waxy materials in plant cell wall dietary fiber and, 20
- Weightlessness in space flight energy utilization and, 266
- Weight loss rapid gallstones and, 308-9
- Western diets dietary fiber and, 25 gallstones and, 316
- Western Europe breast cancer and, 147
- "Wet tail" syndrome gallstones and, 315, 319
- Wheat dietary fiber and, 20, 23, 30-31 "empty calories" and, 3 food processing and, 124, 129 gallstones and, 316
- Whey fat substitutes and, 481
- Women adipose tissue and, 212, 214, 225 cancer risk and, 396-99, 401, 404-7, 410-11 endemic goiter and, 10 gallstones and, 306, 310, 312-13, 319 high-density lipoprotein and, 302 hyperhomocyst(e)inemia and, 283 iron-deficiency anemia and, 8 lactating, 103-5, 108-9, 111-15, 418-37 tryptophan and, 237, 239

# 514 SUBJECT INDEX

## X

- Xanthan gum
  - fat substitutes and, 481
- Xanthurenic acid
  - pellagra and, 11
  - tryptophan and, 238
- X chromosome
  - urea cycle and, 94
- Xenobiotics
  - food processing and, 131
- Xenopus laevis*
  - iron-responsive element binding proteins and, 351, 356
  - iron-responsive elements and, 349-50

- Xeroderma pigmentosum
  - retinoids and, 166-67
- Xerophthalmia
  - vitamin A deficiency and, 429
- X-ray studies
  - dietary fiber and, 23
  - retinoids and, 169
- Xyloglucans
  - dietary fiber and, 21
- Xylose
  - dietary fiber and, 21-22

## Y

- Yeast
  - aconitase and, 352
- Yellow squash
  - antioxidant properties and, 146

- $y^+$  system
  - placental nutrient transport and, 188

## Z

- Zeaxanthin
  - human milk and, 429
- $Zn^{2+}$ 
  - complex carbohydrates and, 25
  - esophageal cancer and, 173
  - ferritin and, 357
  - food processing and, 123
  - placental nutrient transport and, 199
  - space flight and, 270-71

